Session 7 Nutrition, residues and health

L 1 CONSUMER ISSUES AND ACCEPTANCE OF MEAT

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ABSTRACT
Ultimately the success of a product depends on its acceptance by the consumer. With today's stable or slightly declining per capita meat consumption, research is continuing towards an explanation and understanding of the phenomena involved in preference and choice which will be of increasing importance in competitive markets. Two major components are thought to determine choice: the qualities of the product itself and the extrinsic factors such as the demographics and attitudes of the consumers. Thus the image, motivations and attitudes of consumers towards meat may in part explain their acceptance or rejection of a product.
Acceptability of meats is therefore seen in a wider context in which, in addition to the quality of the product which remains paramount, information is being sought increasingly about the product or general information about its production and how this fits into our life-styles. Currently the major concerns are safety, human health, animal welfare and the environment. The influence of these on the acceptability of meats will depend upon the individual's level of concern and his understanding and also on the general views of others who may be influential. These have been expressed in socio-psychological terms as individualistic and collectivist factors. The weighting of the individual factors is likely to vary among consumers and non-consumers. The role of the researcher is to identify and quantify those factors important in consumer acceptance.
These consumer issues in meat have increased over the past 2 decades and much has been published in the domains of social sciences and marketing. To supplement these approaches there is a need for a more experimental approach particularly to help the industry to improve both its marketing and quality assurance systems and to respond to changing consumer opinions and lifestyles.

INTRODUCTION
World food consumption has grown steadily since the 1980's and we can expect a further increase in demand in the next 2 decades when the world population is expected to increase by more than 1.2 billion people, almost all of whom will be in low- and middle-income countries. The global meat economy represents more than 50% of the agricultural production in developed countries and 25% in developing countries. The consumption of meat in EU-15 has doubled in the last 35 years, due partly to the increased in population. The consumption per capita increased until 1980 and then slowed down and stopped in about 1988. In the increase before 1980, the growth in red meat was lower than that in white meats and, after 1980, growth in red meat stopped whilst white meat continued.

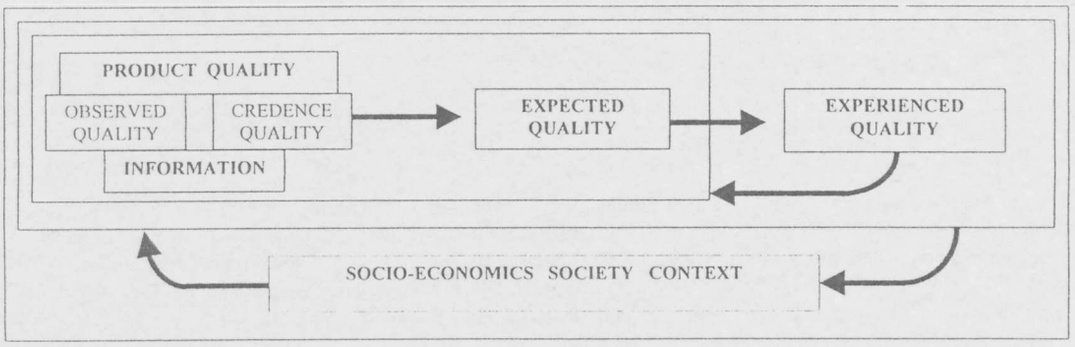
The origins in this stable or declining meat sector have been sought at the level of the individual consumer who appears to be concerned about safety and quality of foods and who is concerned about the environment and ethical considerations in meat production. This trend and inability to predict consumer demands is not specific for meat but pertains to all sectors of the agro-food industry. Some 80-90% of all new consumer products launched fail at the point of market acceptance. More specific to the meat sector have been the accidents, scandals, particularly dioxin in poultry, foot and mouth and the much more longer-lasting BSE (Gregory, 2000).
Meat and meat products have a specific place among foods on which Western people regularly spend up to 30% of the household expenditure.
It is no longer sufficient to state that a product is of 'high quality' but must be supported by specific benefits to the consumer to motivate them (Moskowitz, 1995). Therein lies the essential difference between sensory research which studies the characteristics of the product itself and consumer research which studies the person and his interaction with the product.
Today's consumers appear to resist classical classifications into homogeneous groups. Apparently we are becoming more individualistic and more demanding. It has been suggested that in the modern affluent world of consumerism, product quality and price may not be automatically decisive and that hedonism (desires, image, fun and fantasy) may be more important (Dagevos and Gaasbeek, 2001). If this is true in general, then socio-cultural and socio-psychological factors should be added to the more traditional socio-demographic and soci-economic factors to better account for consumer preference and choice (Dagevos and Gaasbeek, 2001).
Consumers are very good at arriving at an overall attitude but they are poor analysts – this is the domain of sensory analysis. Consumers are prone to 'halo' effects and have difficulty in separating their judgements into individual characteristics. They arrive at a logical conclusion but seem incapable of describing any logical process involved.
Descriptive (qualitative) consumer testing may be done by interviews or discussion (focus groups) which can provide information of a general or extreme nature on which to take action, for example in the development of new products. Quantitative information on attitudes, beliefs can be performed by questionnaire and product testing can be done as a hall test (where all the preparation and cooking conditions can be standardised) or in the home. In this case samples can be left, for the household to prepare and cook, or products can be tested in the presence of an investigator which could be useful for testing the quality of products not requiring home preparation or for studying appearance characteristics. Quantitative tests require experience in design of tests, questionnaire formulation and, above all, in interpretation. Unfortunately, the older published research often only reports consumer panel averages but with the advent of multivariate statistics individual responses can be handled and groups of consumers identified.
It should be noted in all testing that expressed preferences may be different to the preferences when the product is tested. A clear example of this was shown when qualitative tests showed that pizza would be preferred with more meat and cheese but when tasting were performed more cheese but not more meat was preferred (Fishken, 1988).
Most of the research has been done by questionnaires of consumer and non-consumer attitudes which tend to show a strong influence of extrinsic factors but experimental test marketing, including experimental auctions for example, tend to suggest that the objective qualities of the product are more important. Care should however be given when trying to compare different trials which have been conducted in different countries and at different times.

The major difficulty for the meat industry is that meat quality is estimated from appearance which may bear little relationship to its taste on which an judgement of acceptability is largely based.

TODAY'S CONSUMER

When choosing meat, consumers often decide quickly but when asked to describe the reasons for their choice they take much longer to rationalise their choice (Steenkamp, 1989). Many attempts have been mad to investigate this process. Figure 1 is a simplified concept of the factors which can come into play when trying to study and explain consumer behaviour. Most quality concepts, (Total Food Quality, Quality Guidance, Quality Function Deployment and Quality Formation) are based on the individual and concern 'quality expectation' which, together with the product characteristics and 'experienced quality', is crucial for product development. The concept (Figure 1) is similar to the Total Food quality Model (Bredahl *et al.*, 1998) except that a further level of consumer group has been included. This may include an addition set of information and characteristics common to the group or influenced by common aims (eg. political or environmental) above that of the individual. This group may be important when trying to explain behaviour and targeting marketing. The concept is that the individual develops an expected quality of the product and if this is satisfactory, he will buy it and then experience the quality. This experienced quality can be recalled at the next purchase and thus influence the expected quality and purchase of the next product. The expected quality is based on 2 main factors: the quality, or more correctly the perceived quality, of the product itself and a 'credence factor' which is what he believes will be the value, quality, risk, etc. Information provided with the product could be credence factor, for example a label indicating 'good for the environment'. This is a credence factor because the statement cannot be verified by the individual. The impact of such information will also depend, in this case, on the individual's concern and knowledge of the environment. Credence will be based on attitudes, information and experience.

Figure 1. Schematic overview of the interactions of the 5 components of 'Quality'



At the level of the individual, there are increasing concerns about and requests for healthy and safe foods as well as growing environmental and ethical concerns. This implies that consumer issues should become a central element in any production and marketing strategy. The setting up of traceability systems, branding and labelling and product development are related areas which aim to reduce consumer concerns by reducing the individual's dependence on credence factors.

Attitudinal studies have revealed the importance of 'appreciation', 'animal welfare', 'health restraint' for adolescent Australians (Worsley and Skrzypiec, 1998). Adolescent girls seemed more affected by their animal welfare concerns (Figure 3). These attitudinal variables accounted for more of the variation in consumption than did socio-economic items and the reported consumption of men and women were predicted by slightly different sets of attitudinal and socio-economic factors. In an experimental study of choice of beef steaks, socio-economic data also accounted for little of the variation in choice of which the first 2 dimensions of a correspondence analysis accounted for only 27% of the variation in choice (Dransfield and Zamora, 1997). Those consumers taking lower priced steaks tended to be young, single and with low revenue.

The 'appreciation' factor is related to liking but also social situations as well. Other factors were also self-related except 'animal welfare' and suggested that more non-self items, such as ecology and concern for the starving, might be included in future studies.

Two types of quality are distinguished: experienced quality attributes (sensory characteristics, convenience, freshness) and credence characteristics (naturalness, wholesomeness, environmental). Consumer concerns can be individualist, which concern with the product itself, mainly its safety and quality, and collectivist which is related to animal welfare, environmental sustainability, fair trade, growth hormones and genetically-modified organisms. In general the individualistic side is concerned with the product and the collectivist side with the process, or more correctly, their view of the process. This importance of each of the factors in the model will vary with time. The people themselves change and the products are evaluated in the light of the current economic and social climate and in competition with new products.

In a test of the relationship between expected and experienced qualities, in which consumer assessed beef they had bought, it was shown that 63% of the experienced quality was attributed to quality attributes and expected quality (Bello Acebrón and Calvo Dopico, 2000). This is considerably higher than other studies and may reflect the difference in method. In that study, the consumers themselves assessed the experienced on meat which they had bought. This may be largely a rationalisation of their choice of beef and needs to verified under conditions in which the assessments of expected and experienced qualities are conducted independently. Much poorer relationships were found in a study with 200 German consumers. Quality experience and quality expectations were moderately linked but quality expectations and quality experience were only weakly related to objective product characteristics (Bredahl *et al.*, 1998). Quality cues were colour, fat distribution, marbling and drip. Expected qualities were nutritional value wholesomeness, freshness, leanness and another dimension: juiciness, taste and tenderness. Expected qualities (nutritional value etc.) were reasonably correlated with some experienced values (r = about 0.5) but less so with taste (r = about 0.3). The conclusion was that consumers lack confidence in judging the meat quality and that the industry and marketers must increase consumer confidence in judging meat quality.

In addition to the individual, at the higher level (Figure 1), we introduce the dependence of the appreciation on the interaction with other individuals. This may be information, education or social interaction which can affect the appreciation of the product by the individual. The location may be important also as tender steaks are considered more acceptable in a restaurant than in the home (Miller *et al.*, 1995). Home

placement testing has the advantage that this is the usual way people eat meat but has the disadvantage in that the conditions of preparation, cooking and serving cannot be controlled and may be unknown to the investigator. In a study of lamb legs (Dransfield *et al.*, 2000) tasted at home, 976 individuals from 18 families in 6 region of Europe (Bristol, UK; Clermont Ferrand, France; Thessaloniki, Greece; Reykjavik, Iceland; Udine, Italy and Zaragoza, Spain), it was shown that 'liking' scores were more related among individuals within a family than between households and that this effect increased as the number of interactions (number of household members) increased. In the family situation, results may depend on a family 'consensus' or may be swayed by one or members of the family. Other social effects are clearly evident since people can control another individual's behaviour in different ways, by their presence, by their communication and behaviour. Thus the consumption of ice cream (Berry *et al.*, 1985) and of calories (de Castro, 1991) is higher when eating in groups. Such social effects are most evident in Hindu society in which, the person who touched the food and who prepared it and who sits and eats with whom are prominent contextural influences (Appaduri, 1981).

Table 1. Reasons for choice of steaks before and after tasting

Values are the percentages of 967 words before and 857 words after tasting by 151 subjects. Data from Dransfield *et al.*, 1998.

	BEFORE	AFTER
Appearance/fat packaging	28.5	9.0
Colour	17.2	6.3
Labelling	11.5	2.2
Stringiness	10.2	3.7
Size/shape/thickness	7.9	1.5
Price	6.0	6.3
Taste	0.3	16.2
Tenderness	9.0	41.8

Table 2. Importance of Price and Income

Values are the percentages of the variations in consumption of veal and beef explained by income and price.

Country	1955-1979	1975-1994
Italy	82	47
Germany	81	69
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The quality characteristics have been the subject of many research publications. Colour and fatness are mentioned most often where colour deterioration is related to non-purchase of meats in retail display (Hood and Riordan, 1973) and lean meat has been increasingly preferred (Figure 3). These appearance characteristics are often poorly related to independently-measured quality characteristics after cooking. However a significant number of people (9%) cite 'tenderness' as a reason for choice, despite the fact that research has been unable to identify a tenderness component in appearance which is related to tenderness after eating (Table 1). Consumers therefore appear to reason after the event or have an expectation of taste based on appearance.

In a study on steaks (Grunert, 1997), purchasing motives and quality aspects were found, in Germany, Spain and France, to be uni-dimentional and fulfilled both personal and social motives. In France purchasing motives appear more complex, including 'cultural' (tradition and versatility) and social (children, guests, cooking skills, status and atmosphere) aspects. Again, quality aspects appeared to be 2-dimentional comprising 'reason' (health, nutrition) and 'hedonic' (fresh, lean, tasty and tender) aspects. Questionnaires reported that sensory properties are the most important and more important than price, nutritive aspects, place of purchase and ease of preparation (Shafer, 1978; Schultz *et al.*, 1986; Touraille, 1992).

Consumers are generally becoming wealthier and wealth is related to meat consumption on a global scale (Sebillotte, 2000). Over the last decade for a group of 90 countries (representing over 4 billion people), the consumption of animal protein is positively related ($r = 0.82$) with average individual income up to an income of about $7000 and a consumption of 70g/capita/day. At this level, a wide variation, which is not income dependant, occurs between countries which could be due to different cultural and social factors. Market segmentation according to price appears to be changing in Europe with the consumers choosing the middle range price decreasing from 50% in 1973 to 33% and being squeezed by increases in the top and low price consumers (Claus, 1991). Further investigations would be useful (Valin, 2000) as these factors are poorly understood. In Europe (Table 2) the amount of consumption of beef and veal explained by price and income has fallen from 95% before 1980 to 68% in recent years: the greatest decrease, from 82 to 47%, having occurred in Italy. Figure 2 shows recent experimentation where people were asked to choose steaks at a variety of relative prices. It is clear that most consumers are not prepared to pay more when basing their judgement solely on appearance but are prepared to pay more for guarantee of quality (Dransfield *et al.*, 1998). However, a small proportion (10%) are prepared to pay more: for them presumably higher price is associated with higher quality.

MEAT CHARACTERISTICS

Appearance and price can be regarded as meat qualities but taste, the major characteristic of acceptability, can be considered as a credence factor since it cannot be assessed directly at the point of purchase. Clearly the development of a method for measuring such characteristics on raw meat would be invaluable in strengthening the expected and experienced qualities of meat.

Most people throughout the world appear to prefer tender rather than tough meat. In France, half of consumers judged beef not sufficiently tender (CIV, 1988). In explaining differences in quality between countries it is assumed that the quality of a particular piece of meat is the same. This appears to be true for tenderness but there are significant differences among countries in the appreciation of beef flavour (Dransfield *et al.*, 1984). Although a wide variation in tenderness in experimental situations is usually the dominant factor, when texture differences are smaller, flavour notes could be important in acceptability. Light coloured meats are preferred in Spain (Bello Acebrón and Calvo Dopico, 2000). Both breed and feed affect aspects of eating quality and specific breed/systems of production result in meats which have particular qualities which.

through tradition and culture, are likely to be preferred (Dransfield *et al.*, 1984). Comparisons of Spanish and British lamb meats showed similar ratings for quality attributes in the 2 countries but differences in the hedonic ratings for flavour, each panel preferred its own home-produced type of lamb meat (Sañudo *et al.*, 1998). The Spanish preferred a more delicate lamb flavour associated with lighter, younger milk-fed lambs. The differences in hedonic response were thought due to differences in preferences and culinary habits of the tasters.

Sheep meat consumption varies among countries and is low in Asia where it is often cited to have an unacceptable odour or flavour. China consumes little lamb but is potentially a large market if the defaults in flavour could be overcome. Volatile branched chain fatty acids (BCFAs) present in all fatty tissues are thought responsible for poor flavour. These are related to acceptability, high levels being associated with barnyard/sour notes more important for Japanese than New Zealand consumers (Prescott *et al.*, 2001). Strategies for reducing the levels of BCFAs point to reducing the high energy feeds which yield higher concentrations, reducing fat content, where BCFAs originate, and adding spices and flavourings to mask or complement the odour and taste given by BCFAs.

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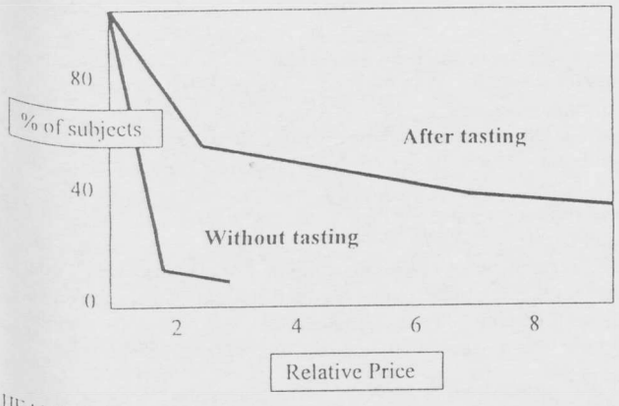

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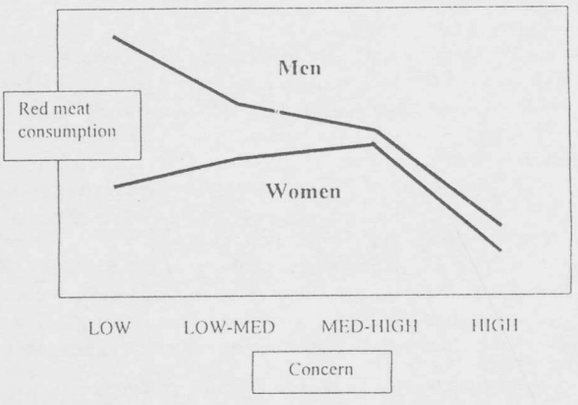

HEALTH and SAFETY

Just as in the case of 'quality', what is important in how 'safety' and 'health' are perceived by the consumer. Whilst a standard can be proposed we cannot define its importance to any individual consumer. As pointed out by Cardello, 1995, how safety is perceived could be critical. Concern for health has also increased and healthiness is one of the most often reported reasons for increase in preference for leanness.

In the UK, government reports into the extent of heart disease encouraged healthy eating programmes in the early 1990s and the importance of animal fats which realised and reaffirmed the links between what we eat and our healthiness. Similar programmes exist in other countries. There is some concern, particularly for younger people, that this could lead to a further trend away from red meat to chicken, fish, pork and other foods (Worsely and Skrzypiec, 1998). Two reasons have been proposed for this trend: a negative attitude towards red meat and a cholesterol-rich red meat being unhealthy. Although fat is thought to contribute to taste, health considerations may override an overall appreciation of quality. A significant reduction in the level of fat preferred by consumers was shown by comparing 2 surveys in the UK which showed that the percentage of consumers preferring lean beef increased from 30% in 1955 to 70% in 1982 (Table 3). Not everyone chose the same level of fatness so, it is clear that no one level of fatness will satisfy all consumers. It is also interesting to note that, in that survey, more butchers chose fatter meat than their customers. The elderly also showed a tendency to choose the fattier meat. This may have been that they could not afford leaner meat or that they were less concerned about its influence on health. With respect to human health, nutritional guidelines put increasing emphasis on reducing the ratio of n-6/n-3 poly-unsaturated fatty acids and recently conjugated linoleic acids (CLA) in animal products have gained interest. CLA are cis/trans conjugated isomers of octadecadienoic acid (C18:2) and in the rumen and rumen products a natural isomer 9-cis and 11-trans is produced as the first stage in the biohydrogenation of linoleic acid to stearic acid (Kepler and Yove, 1967). CLA is believed to be responsible for the anti-carcinogenic activity (Ha *et al.*, 1990) and to reduce breast cancer (see Parodi, 1999). Ways of changing the fatty acid composition of meats to improve health were discussed at ICoMST 2000 (Enser, 2000).

Several studies suggest that substitution of specifically-manufactured low-fat products can be easily adopted and maintained. This can significantly influence the micro-nutrient composition of the diet, although this may not result in an overall net effect on total energy intake or body weight status. Therefore the understanding of the long term acceptance of these products, such as the relationship between changes in preference and for the sensory characteristics of reduced fat foods, is vital to ensure their commercial success and dietary benefit. In one study, reduced fat sausages (188kcal/100g) were rated as acceptable as full fat sausages (334kcal/100g) but information about the 'reduced fat content had no effect on hedonic ratings (Stubenitsky *et al.*, 1999). The general purpose of label information is to shift sensory judgements into line with an individual's beliefs. In blind ratings of sausages containing 12 or 20% fat similar sensory ratings were obtained but when false information was given (that the sausages with 20% were labelled 12%), liking increased, but decreased when the correct information was given (Solheim, 1992).

Thus information which identifies products as low or lowered fat content generally lower judgements of expected quality but the size and the extent of the effect differ markedly among consumer (Aaron *et al.*, 1994). Therefore characterising consumer sub-groups by their attitudinal characteristics may explain differences in response to the information.

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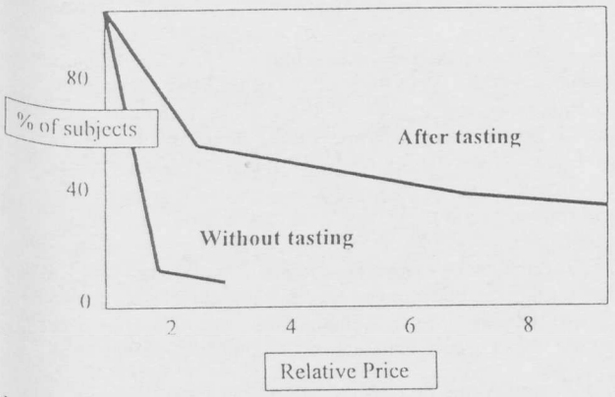

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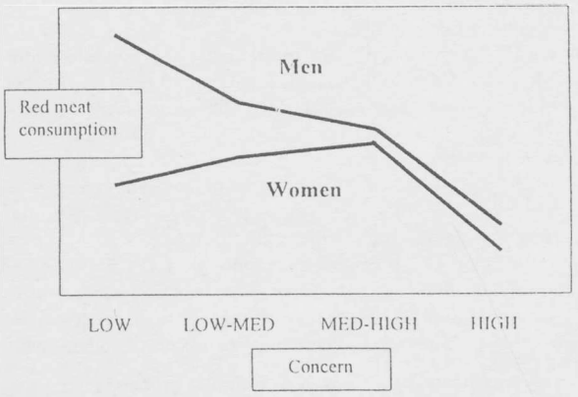

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Concern for health has also increased and healthiness is one of the most often reported reasons for increase in preference for leanness.

In the UK, government reports into the extent of heart disease encouraged healthy eating programmes in the early 1990s and the importance of animal fats which realised and reaffirmed the links between what we eat and our healthiness. Similar programmes exist in other countries. There is some concern, particularly for younger people, that this could lead to a further trend away from red meat to chicken, fish, pork and other foods (Worsely and Skrzypiec, 1998). Two reasons have been proposed for this trend: a negative attitude towards red meat and a cholesterol-rich red meat being unhealthy. Although fat is thought to contribute to taste, health considerations may override an overall appreciation of quality. A significant reduction in the level of fat preferred by consumers was shown by comparing 2 surveys in the UK which showed that the percentage of consumers preferring lean beef increased from 30% in 1955 to 70% in 1982 (Table 3). Not everyone chose the same level of fatness so, it is clear that no one level of fatness will satisfy all consumers. It is also interesting to note that, in that survey, more butchers chose fatter meat than their customers. The elderly also showed a tendency to choose the fattier meat. This may have been that they could not afford leaner meat or that they were less concerned about its influence on health. With respect to human health, nutritional guidelines put increasing emphasis on reducing the ratio of n-6/n-3 poly-unsaturated fatty acids and recently conjugated linoleic acids (CLA) in animal products have gained interest. CLA are cis/trans conjugated isomers of octadecadienoic acid (C18:2) and in the rumen and rumen products a natural isomer 9-cis and 11-trans is produced as the first stage in the biohydrogenation of linoleic acid to stearic acid (Kepler and Yove, 1967). CLA is believed to be responsible for the anti-carcinogenic activity (Ha *et al.*, 1990) and to reduce breast cancer (see Parodi, 1999). Ways of changing the fatty acid composition of meats to improve health were discussed at ICoMST 2000 (Enser, 2000).

Several studies suggest that substitution of specifically-manufactured low-fat products can be easily adopted and maintained. This can significantly influence the micro-nutrient composition of the diet, although this may not result in an overall net effect on total energy intake or body weight status. Therefore the understanding of the long term acceptance of these products, such as the relationship between changes in preference and for the sensory characteristics of reduced fat foods, is vital to ensure their commercial success and dietary benefit. In one study, reduced fat sausages (188kcal/100g) were rated as acceptable as full fat sausages (334kcal/100g) but information about the reduced fat content had no effect on hedonic ratings (Stubenitsky *et al.*, 1999). The general purpose of label information is to shift sensory judgements into line with an individual's beliefs. In blind ratings of sausages containing 12 or 20% fat similar sensory ratings were obtained but when false information was given (that the sausages with 20% were labelled 12%), liking increased, but decreased when the correct information was given (Solheim, 1992).

Thus information which identifies products as low or lowered fat content generally lower judgements of expected quality but the size and the extent of the effect differ markedly among consumer (Aaron *et al.*, 1994). Therefore characterising consumer sub-groups by their attitudinal characteristics may explain differences in response to the information.

Considerable research has concentrated on the role of marbling to meat acceptability and which may improve taste but also have a negative influence being thought to be unhealthy. More research is needed in this area since, as shown by Mederios *et al.* (1987), when a household panel thought steaks from concentrate fed steers had more flavour than grazed steers but in a test market they were equally acceptable.

Reduction in fat content have been tested by sensory panels but less often with consumer panels. Park *et al.* (1990) showed that frankfurters with added high-oleic sunflower oil and high moister (70%) were equally undesirable as products with 29% animal fats. The type of labelling will be important. In Bologna sausage (Kähkönen and Tuorila, 1998), information about the low fat content was considered negative being associated with low quality, at least for the 18 to 30 year-old men participating to that study. Alternative labelling such as 'light Bologna' may be more successful. The success of the irradiation of meat products will depend not only on the efficiency of the process but on convincing the public by effective information and labelling.
During the period 1993 to 1998 in the USA government regulations of nutritional labelling became mandatory. Test were conducted to see if this change could account for consumer choice and preferences. Factors of the consumer (income, knowledge about nutrition, use of nutritional labels) and the product characteristics (price, nutritional value) were used to obtain preference characteristics. Prices, advertising, price reductions and consumer preferences for taste had a significant effect on demand for frozen prepared meals whereas knowledge about nutrition and nutritional labelling did not. The consumer preferences and purchasing patterns for these foods did not change significantly after the implementation of mandatory nutrition labelling (Mojduszka and Caswell, 2001). Information given to the consumer concerning minimally processed products will be largely done by product labelling (Martens, 2000) and the type of wording used about food ingredients and processes is an interesting area for future studies.
Increasing the PUFA content of pork in relation to SFA would better meet the requirements of the health-conscious consumer. Enriching n-3 PUFA and Mono-UFA would be an additional benefit pork fat (Verbeke *et al.*, 1999) in which PUFA in the feed can be directly related to PUFA in the fats. Identifying attitudinal, cognitive and involvement characteristics of consumers showed that those with a positive attitude to fish were willing to try several PUFA-fed fish and they had a more positive perception of the fish qualities and were willing to pay extra. However involvement in healthy eating does not necessarily translate into purchase as health may not be the priority when purchasing. In general the production of PUFA fish should proceed but with caution (Foxall *et al.*, 1998) because there are consumers who pay lip-service to the benefits of healthy eating whilst showing a reluctance to change their behaviour. Consumers refused to purchase PUFA eel and so we cannot generalise about the effect of such a change in dietary lipids.
Another more recent concern has been the amount of salt consumed which has been recommended to be reduced to half to decrease deaths from hypertension-related illnesses. However there are few research consumer studies on this relating to meat products and consumer acceptance despite the demonstration that 82% of consumers thought processed meats were 'too salty' whilst only 31% thought they were 'not salty enough' (Moskowitz, 1995). Meeting the challenge to reduce salt content whilst retaining taste would benefit both the industry and the consumer.

The impact of dioxins in chicken meat in Belgium produced a negative press for both poultry and pork meats whilst increasing beef perception and showed that safety issues would be paramount in future meat consumption (Verbeke and Viaene, 2001). However, the top cited attributes (quality, freshness, free from hormones and healthiness) did not change, although 'healthiness' was cited more frequently after the scare (10% as opposed to 5 % before the scare). In these studies they showed a 3 factor attribute perception of beef, pork and poultry meats. The profiles were similar for all species: the first factor (accounting for about 1/3 of the total variation) related to quality, safety, animal friendliness; the 2nd (about 14%), taste, fitness, tenderness and the third (less than 10%), price. Concerning intended consumption, decrease in fresh meat consumption in the future are associated with a higher degree of importance attached to 'safety', 'healthiness' and 'animal friendliness'. This finding in Belgium, that meat is mainly appreciated for its taste and that meat consumption is threatened by its health, safety and animal welfare image fits with earlier findings (Richardson *et al.*, 1994; Schifferstein *et al.*, 1998).

ANIMAL WELFARE and the ENVIRONMENT

Consumer are becoming increasingly interested in attributes which reflect the production process rather than the quality of the product itself. Maybe this is a way of reassuring themselves of what they see as a better quality faced with the lack of visual cues to predict eating quality. This may have arisen because they are becoming better informed of how foods are produced and of the possibilities which exist for production which not available a few decades ago.
The public perception of genetically-modified foods when applied to animals is one of 'causing ethical concern, being unnatural, harmful and dangerous' whilst, when applied to plants or micro-organisms, genetic modification is 'beneficial, progressive and necessary' (Frewer, 1997).
More recent concerns have been expressed about animal welfare and the environment. The most important attributes in a questionnaire comparison of 5 European countries carried out at the end of 1999 (Bernués *et al.*, 2001) were 'animal feeding' (83% of replies rated this 'important' or 'very important') and 'origin of the meat' (82%). 'Environmental-friendly production' (73%) and 'animal welfare' (78%) were also important. 'Animal breed' and meat characteristics of 'processing and packaging' were less important. Nationality was the best single factor explaining the differences between groups of consumers with age, sex, place of residence and family size also important. Animal feed and origin of meat were also found among the most important credence factors for beef in different European countries (Glitsch, 2000).

The throw away eighties became the eco-sensitive nineties. In response to demand from companies, the British Standards Institute published the world's first standard for environmental management (BS 7750). Had the green consumer really arrived?

Using longitudinal studies, the breadth and depth of green consumerism was shown in the UK. Green products in the USA have increased since about 1985 and have increased dramatically since 1990 and now represent about 12% of all new products. In many countries, over 80% of consumers also express concern about environmental issues (Table 4).

The level of interest in the mass of market research show that green consumers are not 'a marginalised minority'. From several sources a profile of the green consumer can be derived (Titterington *et al.*, 1996). Those mostly concerned declare that they consume less red meat. There were clear gender differences. Women are more concerned than men about the environment and also those with children and those in the more educated social grouping classifications. In more detail, those who actively seek green goods (39% of a UK sample) are more likely to be female, with children and more influence by quality than by price. Those buying green goods only when come across them (20%) are evenly divided among the sexes, tend to be 25-34 and 55-64 years old and are more price sensitive the first group. About 25% are those who care about the environment but have not changed their habits. These are mainly men and are price-led. In a study in Ireland the 10% who responded that they regularly bought organic foods in 1998 rose to 35% in a similar study 2 years later. The reasons stated for buying organic foods were that they were considered healthier, better for the environment and had a better taste and freshness and were given in both surveys. The reasons for not buying organic foods was their lack of availability and high price.

Table 3. The percentages of people preferring the fattier beef rib cuts

Consumer were asked to choose beef in similar surveys conducted in 1955 and 1982. Value taken from Dransfield, 1983.

Occupation	1955	1982	Age	1955	1982
Farming	75	28	<30	66	26
Butchers	61	49	30-39	61	28
Others	64	25	40-49	70	26
Unspecified	65	27	>49	75	33

Source: CNN/Angus Reid Group World Poll 1992

Table 4. Responses (%) to the question:
'I am very worried about the state of the environment

Country	Strongly agree	Moderately agree	Both
Hong Kong	62	23	85
France	46	34	80
Japan	37	53	90
USA	37	51	88
Australia	28	54	82
Britain	26	60	86
Russia	23	76	99
India	23	66	89
Italy	21	71	92
Mexico	19	66	85
Germany	18	73	91
Spain	14	83	97

So there appears to be genuine green consumers who are prepared to pay a little more for organic products but this does not mean that they can be exploited since there are limits to their acceptance.
As we have seen for health components in meats, a study of 172 consumers who tasted free-range and regular pork (Oude Ophius, 1994) showed that prior experience had a significant effect on the evaluation. No effects were found for labelling.
The reason appears to be that, whilst most people are aware of environmentally-friendly labels on packaging, they are unsure of the claims and the benefits to the environment (Mainieri *et al.*, 1997.). Thus the primary reason for buying organic foods may be for personal interests rather than a general concern for the environment. More specific and more detailed questionnaires may help us better able to predict green buying in future.

GETTING THE MESSAGE ACROSS

In the USA, current USDA quality grading standards are thought to inadequately identify meat tenderness and, as a result, consumers are uncertain about the tenderness of steak at the time of purchase. The Beef Quality Audit programme is designed to monitor and to improve quality and consistency in beef. In Australia and in the UK, beef schemes includes grading of cuts based on breed and technological factors known to affect tenderness. We have seen the low-fat "Trim Lamb" and "Women and Iron" campaigns. The national quality strategy in Finland was an expression of the competitive advantages and strengths of Finnish food products relating to quality, safety, ethics and ecology. Its purpose was to reduce information imperfections within the supply chain. The beef identification and labelling system in the European Union was developed primarily to reassure the safety of beef products and to increase transparency and traceability of beef products in the beef supply chain. Further developments could include more information about the origin of the product, animal welfare and other factors connected to production.
To test whether or not such information would be useful to the consumer, a recent survey was carried out in Finland (Latvala and Kola, 2001) and showed that respondents were aware of information about expiry dates, packaging and colour of beef and the label mark 'Finnish Beef'. Price was mentioned as a fourth factor. The survey, carried out in year 2000, showed that the major concerns were illnesses caused by food of animal origin, environmental contaminants, chemical residues and pesticides and GMOs. Compositional aspects (fat, salt additives and sugar) were mentioned to a lesser extent. More information was thought to be required on the control of food of animal origin, GMOs in animals, country of origin and the use of hormones in animal production. However 41% of respondents would be unwilling to pay for the extra information mainly because the present 'labels were thought good' (35% of consumers), they 'could not afford the higher prices' (22%), labelling 'guarantees nothing' (17%) and it would 'not give enough information' (13%).
With increased competition, some companies are seeking added value markets. Small companies with limited resources may adopt to market regional products and similar trends may occur over wider geographic areas. From the consumer point of view, this may increase confidence in the knowledge of the origin of the product. There is some evidence that people living longer in an area are more likely to be 'ethnocentric consumers' i.e. preferring regional products. They tend to be socially involved in the region, older and less educated.

Brand loyalty is another option to try to improve consumer confidence. In France 'Charolais' has been used recently to try to reassure consumers of the origin and implied quality of beef. However results showed (Dransfield *et al.*, 1998) that, although adding that label to steaks increased its selection by consumers, the effect was much smaller than the increase produced by a guaranteed increase in tenderness. It would appear then that the word is not linked with quality in the consumer's mind as relevant information generally has a greater influence on perceived quality than less relevant information (Köster *et al.*, 1987). In a questionnaire of sensory attributes, nutrition, price and brand (Schultz *et al.*, 1986), branding achieved the lowest rating and all had low positive correlations with sensory attribute ratings.

CONCLUSIONS

The last 2 decades have seen a change in the meat industry from being production-driven to becoming consumer led. During this period, meat research has mainly concentrated on the understanding and the technological improvements to provide a better quality and variety of product for the consumer. Of course these advances will continue but we should invest more in trying to understand the consumer and his choices and his preferences particularly in this time of increased competition and of stable or even decreasing meat consumption in the developed countries.
The question of confidence in the product and how to translate that to the needs of the consumers must be addressed.
This will need a change of emphasis in research needing to encompass new areas of economy, psychology and marketing. Together with meat scientist and technologists, whio can bring their expertise of production, fabrication of the product and expertise in experimentation, they can respond to the goals set by consumers and society. The result will be mutually beneficial for our understanding and for the future of the meat industry.

As Verbeke and co-authors (1999) pointed out in their review of pork, the challenge will be to deal with further consumer-oriented research and translate other realised improvements into effective pork marketing with the end consumers. I would add that the same is true for other meat sectors.

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