



Consumer preference, behavior and perception about meat and meat products: An overview



Maria Font-i-Furnols*, Luis Guerrero

IRTA-Monells, Finca Camps i Armet, 17121 Monells (Girona), Spain

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ABSTRACT

Meat and meat products currently represent an important source of protein in the human diet, and their quality varies according to intrinsic and extrinsic parameters that can sometimes be shaped to make a product more desirable. Because consumers are the final step in the production chain, it is useful to identify which factors affect their behavioral patterns. This would allow the meat sector to better satisfy consumer expectations, demands and needs. This paper focuses on features that might influence consumer behavior, preferences and their perception of meat and meat products with respect to psychological, sensory and marketing aspects. This multidisciplinary approach includes evaluating psychological issues such as attitudes, beliefs, and expectations; sensory properties such as appearance, texture, flavor and odor; and marketing-related aspects such as price and brand.

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1. Introduction

Meat and meat products are an important source of protein in human diets, and their consumption depends on socio-economic factors, ethics or religious beliefs, and tradition. Globally, pork is consumed the most (15.8 kg/capita/year), followed by poultry (13.6 kg/capita/year), beef (9.6 kg/capita/year) and finally sheep and goat meat (1.9 kg/capita/year) (FAOSTAT, 2014). The consumption varies among and within countries. For instance, in Muslim countries pork consumption is extremely low or absent, whereas it can exceed 50 kg/capita/year in countries such as Austria, Poland, Germany and Lithuania (FAOSTAT, 2014). Fig. 1 shows the distribution of meat consumption by continent, and it is possible to see important differences in both quantity and type of meat.

Consumers are the last step in the production chain, and having their expectations met is an important part of their satisfaction and shopping behavior. It is therefore important to understand the factors affecting consumer behavior. In this paper we will divide the issues that explain these factors into three types: psychological (individual factor), sensory (product-specific factor) and marketing (environmental factor) (Fig. 2). These aspects are interrelated and, in turn, depend on additional factors that affect consumers' decision-making. The importance of the components of the model depends on the consumer, context, culture or available information and might influence individual behavior to

different degrees. In this paper we focus only on some of these aspects and how they affect consumer behavior and preferences for pork, beef and lamb and/or their acceptance. We also examine preferences for some meat products, especially dry-cured ham.

The following general and theoretical overview of the psychological aspects will be examined in order to better understand the sensory and marketing variables, which are presented afterwards via specific examples.

2. Psychological factors

Consumers as rational beings are affected by many external inputs that can modulate their cognitive, emotional, volitional and even automatic actions. The role of psychological influences on people's behavior has been widely analyzed and described in the scientific literature, especially in relation to the selection and purchase of different products, services or experiences (Axelson & Brinberg, 1989). Factors such as motivation, perception, attitudes and expectation drive our ordinary life and make our individual conduct predictable from a social, economic, cultural or psychological perspective. In the next paragraphs, some of these factors—attitudes, beliefs and expectations—are examined in the context of the selection and consumption of meat and meat products.

2.1. Beliefs and attitudes

According to Fishbein and Ajzen (1975), beliefs represent the information that a person possesses about an object, action or event that can

* Corresponding author at: Finca Camps i Armet, 17121 Monells (Girona), Catalonia, Spain. Tel.: +34 972 630052; fax: +34 973 630373.

E-mail address: maria.font@irta.cat (M. Font-i-Furnols).

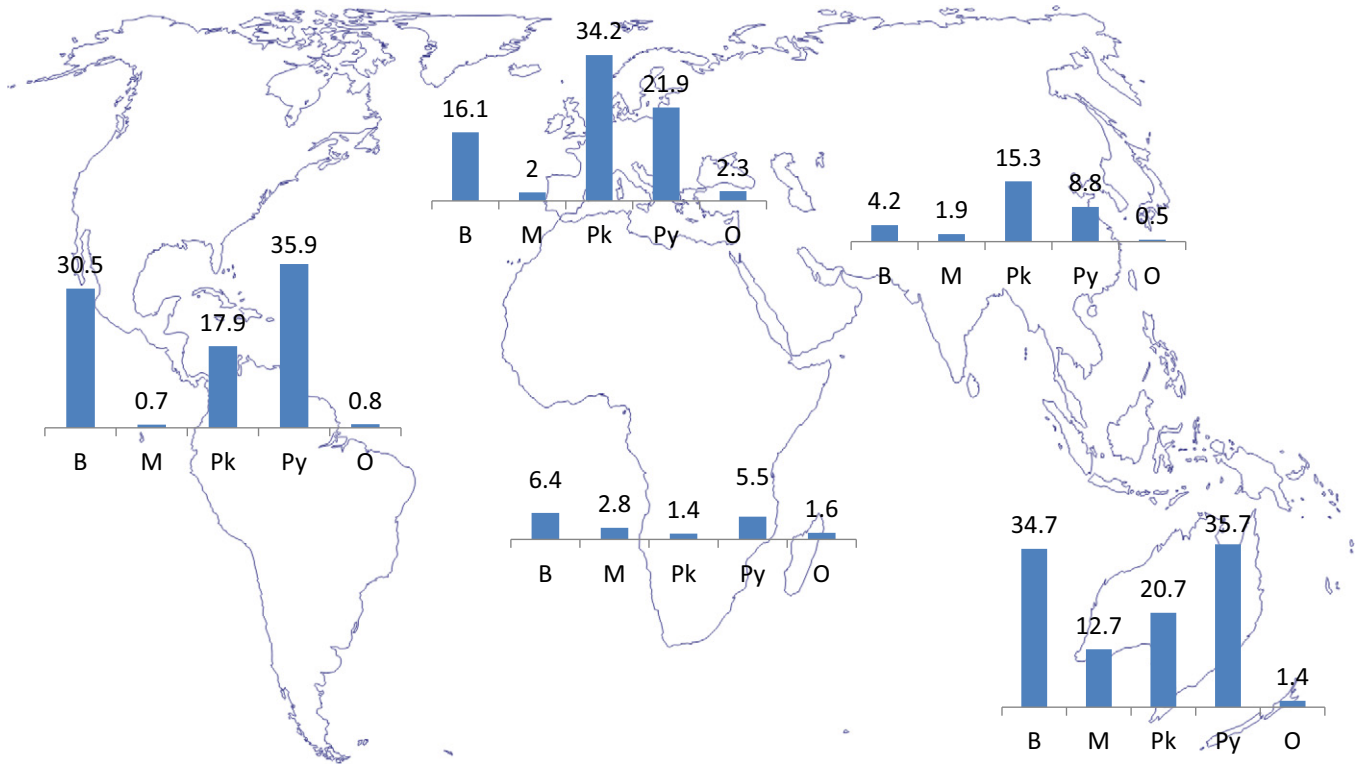


Fig. 1. Consumption (kg/capita/year) in 2009 of bovine meat (B), sheep and goat meat (M), pig meat (Pk), poultry meat (Py) and other meats (O) by continents (Source: FAOSTAT, 2014).

be therefore linked to some attribute. Beliefs can be conceptualized as “cognition” (Axelson & Brinberg, 1989) and represent an individual’s perception (opinion) of the relationship between the given object, action or event and the particular attribute associated with it (Smith, Walker, & Hamidova, 2012). Belief formation is a lifelong dynamic process (Castelfranchi, 2004) that can be developed by direct observation (descriptive beliefs about products are mainly formed by consumers through their experience with them), by information (informational

beliefs are formed by accepting information provided by an outside source such as mass media, relatives, friends, doctors, etc.) and by inference (inferential beliefs are formed by inferential connections through previously acquired experience and knowledge) (Finn, 1981; Fishbein & Ajzen, 1975; Smith et al., 2012). Beliefs are founded on experiences or acquired knowledge and the personal characteristics that determine consumer attitudes, buying intentions and preferences (Friedler & Bless, 2000; Ivan & Penev, 2011; Tourangeau & Rasinski, 1988), even though

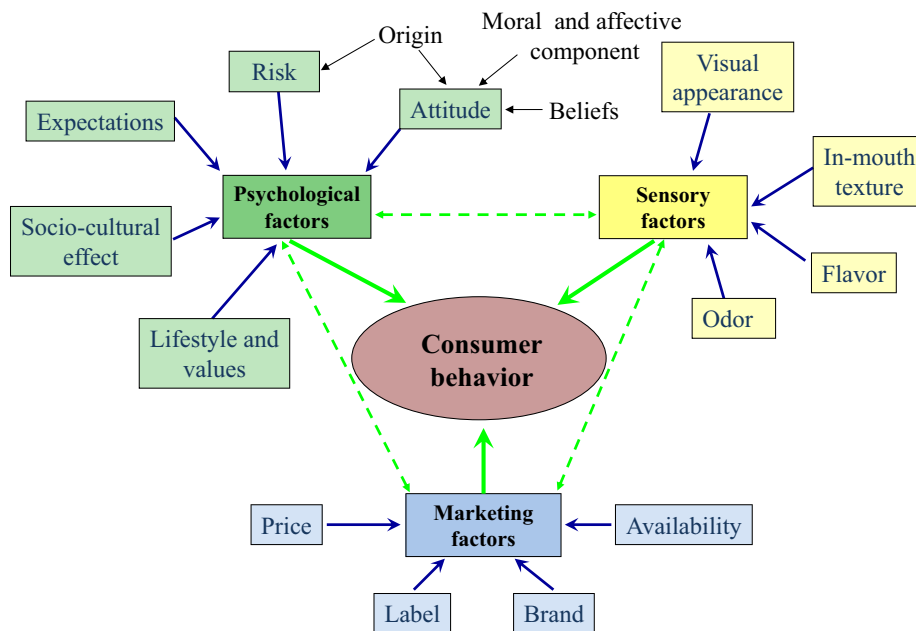


Fig. 2. Multidisciplinary model of the main factors affecting consumer behavior in a food domain.

they may be true or false, correct or incorrect (Claret et al., 2014). In contrast to beliefs, attitude refers to a person's feelings toward and evaluation of an object, person, issue or event (Fishbein & Azjen, 1975), and consequently the distinctive characteristic of an attitude is its affective/evaluative nature (Axelson & Brinberg, 1989). It is worth mentioning that the affective component of attitudes tends to have a stronger effect on risk perception and acceptance than the cognitive dimension (Berndsen & Van der Pligt, 2005).

Attitudes and beliefs about the characteristics of a certain product and the way it is produced, handled or distributed can influence consumer perception (Claret et al., 2014). Generally, people tend to display more positive attitudes and beliefs about their own behavior, and more negative attitudes and beliefs about those behaviors most different from their own (Povey, Wellens, & Conner, 2001), so relationships among these three components should be expected. Consumer attitudes and beliefs about meat and meat products depend on the product itself and on the characteristics of the individual. They are measurable and variable and affect personal emotions and behaviors. Generally speaking and regardless of its traditional character (Guerrero et al., 2012) and established social status, meat tends to have a negative image mainly due its association with the living animal, handling practices and slaughter conditions (Troy & Kerry, 2010), the presence of blood (Kubberød, Uelan, Rødbotten, Westad, & Risvisk, 2002), environmental issues (Povey et al., 2001) and religious, ideological, ethical or moral concerns (Berndsen & Van der Pligt, 2005; Dwyer, 1991). Paradoxically, negative attitudes toward meat production seem to have a limited effect on shopping behavior, probably as a result of low consumer knowledge that tends to be based on indirect sources (Grunert, 2006). In fact, as suggested by Holm and Møhl (2000), negative attitudes toward meat are not necessarily associated with a reduction in meat consumption but tend to be related with changes in the role assigned to meat within a meal (treated as an ingredient, rather than as the most highly valued part of the meal). On the other hand, although the general public claims to be concerned about issues such as animal welfare and strongly believe that it should be assured and guaranteed, in some cases they do not tend to think about it when buying and consuming meat (Guerrero, Claret, Rodríguez, Hernández, & Dalmau, 2013). This behavior might emerge as a result of a psycho-protective mechanism known as 'Directed or Intentional Forgetting' (MacLeod, 2013), which is aimed at de-emphasizing unpleasant or threatening memories consciously or unconsciously. Such forgetting may also help to explain the apparent discrepancy between attitudes toward meat and meat products and their consumption.

Many consumers underestimate the ecological impact of animal production (Vanhonacker, Van Loo, Gellynck and Verbeke, 2013), and although environmental issues and animal welfare are relevant arguments against meat consumption and may generate negative attitudes, health seems to be the widely given reason for changing consumption habits, reducing meat in the diet or even avoiding meat altogether (Latvala et al., 2012). Knowledge and attitudes about diet and meat products also may influence people's choices, specially the likelihood of consuming specific types of meat (Guenther, Jensen, Batres-Marquez, & Chen, 2005). In general, consumers have a positive attitude toward specific nutritional improvements of meat and meat products such as reducing fat or NaCl (Guàrdia, Guerrero, Gelabert, Gou, & Arnau, 2006). However, consumers do not seem to be ready to compromise the sensory features of their food products for potential benefits to their health (Ares, Barreiro, Deliza, Giménez, & Gámbaro, 2010; Tuorila & Cardello, 2002; Verbeke, 2006). According to Guerrero et al. (2011), an important percentage of consumers prefer to diminish their intake of certain products or even avoid them rather than consume a supposedly healthy and tasteless version.

Food safety crises and livestock diseases have altered both consumer and political confidence in animal science and the meat chain (Garnier, Klont, & Plastow, 2003). Meat-related food scares such as BSE, hormones, swine fever virus, salmonella or avian influenza have raised

public consciousness and questions about the risks and benefits of meat consumption. However, the healthiness and nutritional properties of meat currently seem to be more important for consumers than safety concerns (Verbeke, Pérez-Cueto, de Barcellos, Krystallis, & Grunert, 2010). In any case, effective communication strategies such as clear and adequate meat labeling could help to improve consumer confidence in these products (Corcoran et al., 2001) and create attitudinal changes, especially for those consumers who are more concerned about safety and nutritional/health issues. These consumers normally seek more information and tend to trust and read labels more frequently (Bernués, Olaizola, & Corcoran, 2003). In this sense, and according to Grunert (2006), meat quality has increasingly come to mean information about meat instead of its innate properties, and less often refers to conventional extrinsic quality cues such as origin or place of purchase.

Meat and meat products have an important role in many Western and non-Western countries from a social and cultural perspective, and they are a central constituent of our meals and diet despite the overall negative beliefs and attitudes toward them. According to Grunert (2006), this apparent contradiction may partially be explained by the distinction between the roles of individuals as consumers and citizens: we may hold a negative attitude toward meat production and consumption as citizens, but it may be weakly displayed in our behavior as consumers. In general, consumers tend to consider meat to be a healthy and important component of the diet (Verbeke et al., 2010), able to provide nutritious elements such as proteins and vitamins. In fact, meat is so relevant that even vegetarian dishes often include some vegetables prepared as if they were meat, and vegetarian restaurants frequently design their dishes by making them appear similar to meat dishes (Holm & Møhl, 2000). Meat is affected by consumption trends similar to the majority of foods: health concern, interest in variety, ethical and environmental issues, convenience and social role among others. According to Grunert (2006), in certain segments of the population, meat consumption is influenced by convenience and meat avoidance which implies a higher degree of processing that allows more convenience products and lower visibility of the meat ingredients. At the same time, the prevalent negative attitude toward convenience products is slowly diminishing, even in traditional foods (Vanhonacker, Kühne, et al., 2013) such as meat and meat products. Currently, the meat industry faces the challenge of providing more and clearer information that stimulates consumption by asserting environmental sustainability and animal welfare and providing more convenient and healthy options while recognizing the new and changing role that meat and meat products have in our diets.

2.2. Expectations

Expectations can be defined as a group of feelings and/or beliefs inherent to humans concerning the likelihood that something will happen in a certain way or that a product will have certain characteristics. Expectations imply anticipation and some degree of rational thinking, and they thus include the evaluation of similar or related past experiences and available information and are, by definition, subjective in nature.

Everybody has expectations for something in daily life that affect personal reactions and decisions, although sometimes subconsciously (Deliza & MacFie, 1996). Expectations play an important role in the acceptance or rejection of a product, concept, fact or event because they may alter its perception and image even before its test or occurrence. In general, higher expectations imply higher customer requirements and exigencies and accordingly imply a higher likelihood of dissatisfaction and disappointment. As stated by Deliza, MacFie, Feria-Morales, and Hedderely (2000), the expectation formation process starts with the previous information and experiences that will constitute our prior expectations. These prior expectations together with the informational cues available at the shopping place (e.g., the product itself, its package, appearance, label, context,

advertising or price) will generate new expectations. If these new created expectations are low, the product will probably be rejected, but if expectations are high the product is very likely to be chosen and purchased. After selecting a product, the individual will test and use it, and consequently his/her expectation will be confirmed (agreement with what was expected) or not confirmed (disagreement with what was expected, either in a positive or in a negative sense). Different theories are described in the literature about human behavior when expectations of product quality are not met. Although people might respond differently to disconfirmed expectations, the assimilation theory seems to be the most common (Issanchou, 1996). The assimilation theory (or cognitive dissonance) states that in order to diminish the “mental discomfort” created by an unconfirmed expectation, any discrepancy between expectation and product performance will be minimized or assimilated by the consumer, who will change his/her perception of the product to bring it more into line with his/her expectation (Deliza & MacFie, 1996).

In general, consumers have substantial difficulties in forming quality expectations, especially for fresh meat for which little information about the product is normally provided. According to Grunert, Bredahl, and Brunsø (2004), the formation of meat quality expectations is based on a few key cues, principally labeling (including price) and appearance, which do not seem to be very good predictors of its eating quality. The manifest uncertainty that consumers seem to experience when buying meat and meat products can partially explain the importance that butchers' advice tends to have in their buying decision, as shown in many studies on fresh meat (McCarthy & Henson, 2005; Ngapo et al., 2003) or meat products (Morales, Guerrero, Claret, Guàrdia, & Gou, 2008; Resano, Pérez-Cueto, de Barcellos, et al., 2011; Resano, Pérez-Cueto, Sanjuán, et al., 2011). Accordingly, it appears that consumers prefer to delegate the purchase decision to an expert, who is supposed to be more competent at predicting the product quality (Grunert et al., 2004). In the same vein and according to Papanagiotou, Tzimitra-Kalogianni, and Melfou (2013), using price (an extrinsic cue) to form quality judgments is also an indication of consumers' uncertainty and the difficulty they perceive in evaluating meat quality.

Expected quality seems to be one of the most important factors in consumers' intention to purchase food. It is evident that quality cues are used to infer expected meat quality attributes at the point of sale. These cues can be grouped into intrinsic (color, fat content, marbling) and extrinsic (price, origin, quality labels), and their role in developing expectations depends on the type of meat or meat products and on the context (circumstances in which the product and individuals will interact) in which the product will be used or consumed. Fat melting might be an important criterion to increase quality expectations in an Iberian ham but is irrelevant in salami, which in turn would be perceived differently depending on whether it is going to be consumed at home with friends as a pizza ingredient or as salami canapés in a social activity. In any case, it is worth making a clear distinction between the experiential quality attributes such as convenience, freshness or sensory characteristics that will be experienced and ascertained at the time of consumption and the credence quality attributes, such as healthiness or naturalness, that cannot be experienced directly even after frequent consumption. Both quality traits can generate individual expectations, but only quality attributes experienced directly can be assessed, confirmed or disconfirmed. To enhance consumer perception (both expected and experienced) of meat and meat products, additional information provided at the point of purchase (Grunert et al., 2004) may play an important role in reducing uncertainty in the formation of quality expectations. In fact, as stated by Van Wezemael et al. (2012), detailed information seems to be an effective way to facilitate more appropriate expectations and to improve enjoyment.

3. Sensory properties of meat and meat products

Sensory enjoyment of meat is related to several traits as described below: visual appearance and in-mouth perception of both texture and flavor, although preferences for these are not homogenous among consumers. These quality traits depend on several intrinsic and extrinsic factors such as species, genotype, nutrition, age, *ante mortem* and *post mortem* treatment, slaughter procedure, storage conditions and ageing time, although not all of the factors affect all of the cues (Channon, Kerr, & Walker, 2004; Duckett & Kuber, 2001; Pethick et al., 2005). Thus, sometimes it can be difficult to improve one meat characteristic because it depends on various stakeholders in the meat production chain. Moreover, modification in the production chain to produce a desired characteristic can negatively affect other characteristics. What is clear is that these properties affect the consumer's acceptance and meat preferences and consequently their intention to purchase and willingness to pay.

3.1. Visual appearance

Visual appearance characteristics (i.e., color, fat content, marbling, drip loss) are intrinsic quality cues highly related with consumers' expectations of meat quality (Banović, Grunert, Barreira, & Aguiar Fontes, 2009; Bredahl, Grunert, & Fertin, 1998; Verbeke et al., 2005) and their choice at the point of purchase because these characteristics are used to assess food quality (Banović, Aguiar Fontes, Barreira, & Grunert, 2012; West, Larue, Touil, & Scott, 2001).

Meat color is related with the different forms of the sarcoplasmic protein myoglobin and it depends on *ante mortem* (i.e. diet, housing, genetic) and *post mortem* factors (i.e. cold chain management and packaging) (Mancini, 2009). Color has been reported to be one of the most important fresh meat characteristics at the point of purchase (Gracia & de Magistris, 2013; Ngapo, Martin, & Dransfield, 2007; Verbeke et al., 2005), probably because consumers use inadequate color as an indicator of spoilage and wholesomeness (Mancini, 2009). Consumers relate red–purple color with freshness and brown color with lack of freshness (Carpenter, Cornforth, & Whittier, 2001; Faustman & Cassens, 1990; Issanchou, 1996). Furthermore, consumers familiar with meat consumption use color as an intrinsic cue to predict experienced sensory quality (Banović et al., 2012) although not always eating satisfaction was related with color (Carpenter et al., 2001). Meat acceptability depends on cultural aspects, experience or consumption habits. Preferences for color therefore vary between and within countries and are culturally determined (Prescott, Young, Zhang, & Cummings, 2004). For instance, in one international study, Ngapo et al. (2007) reported countries with preferences for light pork, others with preferences for dark pork, and still others with almost equally divided preferences for light and dark pork. Especially in beef, there is a problem with dark meats, mainly due to management practices at different moments of the production chain that produce DFD (dark, firm and dry) meat that also presents technological and safety problems. Dark beef causes acceptability problems, and some studies have reported that light-colored beef was preferred to darker (Bello Acebrón & Calvo Dopico, 2000). Moreover, in Carpenter et al. (2001) work, red was the most preferred color, followed by purple and finally brown. Furthermore, within red color, bright red was preferred to pale red (Greibitus, Jensen, & Roosen, 2013; Realini et al., 2014) or dark red (Killinger, Calkins, Umberger, Feuz, & Eskridge, 2004a). In fact, Corcoran et al. (2001) reported differences in intensity and tonality of the red color depending on countries. For lamb, although color seems to have little importance by consumer in comparison with freshness, some consumers showed preferences for lighter lamb (Bernués, Ripoll, & Panea, 2012), probably because they were used to this type of lamb, which is fed concentrate and has light weight. In other countries where lambs are reared on pastures or to heavier weights and older ages, lamb meat is darker and consumers likely prefer this color because of consumption habits. Khilji, van

de Ven, Lamb, Manza, and Hopkins (2010) showed that lamb color consumers' acceptability was related with the lightness (higher lamb [$L^* \geq 34$] was more preferred) but mainly with the redness (the reddest [$a^* \geq 9.5$] the most preferred) of the meat. In meat products such as dry cured ham, color has also been reported to be important for consumers (Morales et al., 2008), and iridescence produced a change in color that was not appreciated by consumers (Mancini, 2009). Thus, it is very important to improve color stability because it will increase the shelf life of meat and meat products by increasing the time that meat will be visually accepted by consumers at the point of purchase. It can be increased by feeding antioxidants (Arnold et al., 1992), packing in an atmosphere modified with different gases depending on national legislation (McMillin, 2008) or, in sausages or ground meat, by adding antioxidants that minimize and delay the transformation of myoglobin into metmyoglobin, which is responsible for the brownish color (Faustman, Sun, Mancini, & Suman, 2010).

Another important cue related to expected quality and especially to health quality is fat content (Grunert, 1997; Issanchou, 1996; Resurrección, 2003). The quantity and the quality of fat depend on several factors such as specie, sex, diet, age, muscle and genotype (Hopkins, Fogary, & Menzies, 1997; Raes, De Smet, & Demeyer, 2004). Regarding species, consumers perceived pork to be less healthy and fattier compared with beef and poultry (Verbeke, Van Oeckel, Warnants, Viaene, & Boucqué, 1999). In fact, lean pork is generally preferred to fatty pork today, although in some countries (Japan or South Korea) fatty pork was preferred or almost equally preferred to lean pork (Ngapo et al., 2007). Additionally, differences in this preference have been found between geographical regions (Cho et al., 2007). Regarding beef, the fat content was an important cue in consumers' choice, and meat with slightly visible fat (including subcutaneous fat cover and intramuscular fat) was preferred in some countries such as Spain (Bello Acebrón & Calvo Dopico, 2000; Realini et al., 2014). Nevertheless, consumers' preferences for beef according to its fattiness have changed over time, with an increasing preference for leaner beef (Ngapo & Dransfield, 2006). In fact, in the last decades producers have reduced the fat content of pork, lamb and beef carcasses, but this has had some adverse consequences because in some cases a reduction in eating quality has also been reported (Gardner et al., 2010; Karamichou, Richardson, Nute, Wood, & Bishop, 2007; Pethick, Banks, Hales, & Ross, 2006). In pork, one option to reduce fat and increase performance is the use of genotypes with a mutation in the ryanodine (Ryr1) gene (known as halothane gen), but that usually decreases meat quality by increasing drip losses and the incidence of PSE meat (Huff-Lonergan, 2009).

Marbling content is depended on several factors such as breed, diet, sex and weight (Cilla et al., 2006; D'Souza, Pethick, Dunshea, Pluske, & Mullan, 2003; Raj et al., 2002). Marbling is a visual appearance characteristic of the meat that is considered less important than color and fat content in pork (Ngapo et al., 2007), although some studies showed marbling to be the most important cue in consumers' perception of quality and in intention to buy (Papanagiotou et al., 2013). In general, marbling has been reported to negatively affect consumer preferences and the acceptability of red meat (Brewer, Zhu, & McKeith, 2001; Fernandez, Monin, Talmont, Mourot, & Lebret, 1999; Moeller et al., 2010). Nevertheless, as with color, it has been shown that its acceptability varied between and within countries (Ngapo et al., 2007), with marbled pork being generally most preferred in Asiatic countries. In fact, Font-i-Furnols, Tous, Esteve-Garcia, and Gispert (2012) divided consumers according to their pork preferences in marbling into 'lean loin lovers' and 'marbled loin lovers' although when the consumers tasted the meat in blinding conditions, all groups preferred the marbled pork. However, in beef, Killinger, Calkins, Umberger, Feuz, and Eskridge (2004b) found that consumers preferred the appearance of highly marbled steaks and after tasting were also willing to pay more for this type of beef. Hence the reason why, for example, in the US prime (USDA prime) gets the top price. The positive effect of marbling or intramuscular fat in eating quality and palatability of red meats (Bejerholm &

Barton-Gade, 1986; Fortin, Robertson, & Tong, 2005; Pannier et al., 2014), even with minimal tenderness differences (Killinger et al., 2004b), is probably responsible for consumer preference for the taste of marbled meat, although in some studies this relationship was not that clear (Channon et al., 2004; O'Mahoney, Cowan, & Keane, 1991–1992; Rincker, Killefer, Ellis, Brewer, & McKeith, 2008). In meat products such as dry-cured ham, the higher the intramuscular fat content is, the higher the consumers' preference (Cilla et al., 2006; Ventanas, Ruiz, García, & Ventanas, 2007) and the juiciness of the product (Ventanas et al., 2007) will be. Some high-quality meat products such as Iberian dry-cured products are characterized by high levels of marbling (Soto et al., 2010).

Drip loss is an important economical factor in meat production but also a quality cue that is important in consumers' preferences of meat. The absence of drip loss is preferred in most countries (Ngapo et al., 2007; Verbeke et al., 2005), although it is possible to find a small segment of consumers who prefer chops with drip losses (Chen, Guo, Tseng, Roan, & Ngapo, 2010). Drip loss is a special concern in packed meat, and strategies such as minimizing temperature fluctuations, antifog properties of packaging films, including extra absorbent pads, and absorbent tray materials are used to minimize its consequences (Troy & Kerry, 2010). Nevertheless, meat with high drip loss, due to the release of water, might be tougher and less juicy and, consequently, less accepted by consumers. In pork, it is usual to have high drip loss in PSE (pale, soft and exudative) meats which are light in color and not always attractive for consumers. Its incidence is determined by genotype but also *ante* and *post mortem* treatment (see review by Barbut et al., 2008).

3.2. In-mouth texture

Texture is a multi-parameter sensory attribute (Szczesniak, 2002) and consumer perception and the acceptability of tenderness and juiciness are the most studied. Tenderness and juiciness are eating quality attributes that positively influence (to a greater or lesser degree) most consumers' preferences in pork (Aaslyng et al., 2007; Bryhni et al., 2003), beef (Bello Acebrón & Calvo Dopico, 2000; Huffman et al., 1996; Polkinghorne & Thompson, 2010) and lamb (Font i Furnols et al., 2009; Thompson et al., 2005). Furthermore, experienced characteristics of the meat such as tenderness and juiciness, as well as taste, are highly correlated with the overall experienced quality, intention to purchase and willingness to pay (Banović et al., 2009; Bello Acebrón & Calvo Dopico, 2000; Lusk, Fox, Schroeder, Mintert, & Koohmaraie, 2001).

Many studies show that consumers prefer more tender and sometimes juicier meat in pork (Bryhni et al., 2003; Straadt, Aaslyng, & Bertram, 2013), beef (Huffman et al., 1996; O'Quinn et al., 2012) and lamb (Pannier et al., 2014). It is possible to improve the tenderness of meat by optimizing production system factors such as feeding or genetics (King, Wheeler, Shackelford, & Koohmaraie, 2009). However, *post mortem* factors are crucial in determining tenderness and, if those factors are not optimized, the *in vivo* strategies are useless (Maltin, Balcerzak, Tilley, & Delday, 2003). Carcass refrigeration after slaughter, hot carcass hanging, ageing time, as well as cooking procedure and temperature are *post mortem* factors that strongly affect the tenderness of meat (Bejerholm & Aaslyng, 2003; Jeremiah, Tong, & Gibson, 1997; Ngapo, Riendeau, Laberge, & Fortin, 2013). Thus to satisfy consumers' demands it is important to optimize all of these parameters to obtain improved tenderness depending on species (Koohmaraie, 1996) and muscle (Gruber et al., 2006; Hunt et al., 2014; Martinez-Cerezo, Sañudo, Panea, & Olleta, 2005).

Consumer tenderness scores were higher in more aged beef (Brewer & Novakofski, 2007) while the tenderness of light and concentrate-fed lamb was preferred to heavy and grass-fed lamb (Font i Furnols et al., 2009). It has been reported that tenderness and juiciness are positively correlated with intramuscular fat content and the type of fat (O'Quinn et al., 2012; Pannier et al., 2014; Straadt et al., 2013). Tenderness is

also related to sex because consumers perceived tenderness higher for pork from gilts than from castrated males (Ngapo et al., 2013). In-mouth tenderness is related to instrumental tenderness, which is why in some studies, the thresholds for beef tenderness to ensure consumer satisfaction have been determined instrumentally (Huffman et al., 1996; Rodas-González, Huerta-Leidenz, Jerez-Timaue, & Miller, 2009).

Texture is also a relevant attribute affecting the purchase of dry cured ham (Morales et al., 2008). Texture problems such as excessive softness (Morales, Serra, Guerrero, & Gou, 2007; Parolari, Virgili, & Schivazappa, 1994), pastiness (Arnau, Guerrero, & Sárraga, 1998) or crust formation at the surface (Ruiz-Ramírez, Arnau, Serra, & Gou, 2006) might also reduce consumer acceptance of the product.

3.3. Flavor of the meat

Meat flavor is very complex, and it is created mainly when meat is treated thermally because raw meat has only a bloody taste and very little aroma (Mottram, 1998). When cooked, lipids and water-soluble components form several volatile compounds, mainly by means of lipid degradation and Maillard reactions or through reactions between their products. These volatile compounds are the main contributors to meat flavor (Elmore & Mottram, 2009; Mottram, 1998). Additionally, alterations during storage and serving conditions affect the flavor (Dominguez, Gómez, Fonseca, & Lorenzo, 2014; Reid, Young, & Braggins, 1993; Ventanas, Mustonen, Puolanne, & Tuorila, 2010).

Sensory descriptions of flavor and aroma are very complex and can involve a number of attributes. We are not going to focus on the formation of odor and flavor but rather on their perception and acceptability to consumers. Flavor enjoyment is highly correlated with the overall experience of the meat (Font i Furnols et al., 2006, 2009; Oliver et al., 2006; O'Quinn et al., 2012). Furthermore, taste was the most important factor affecting consumer satisfaction with fresh pork, processed pork and pork meat products (Resano, Pérez-Cueto, de Barcellos, et al., 2011).

Flavor depends on intrinsic and extrinsic factors (i.e., species, genetics, sex, feeding regimen, and management practices) (Maughan & Martini, 2012; Melton, 1990). A meat's flavor is characteristic of the species (Maughan & Martini, 2012). Lamb is differentiated from beef and pork because of its flavor intensity (Rhee & Ziprin, 1996) and aroma (Matsuishi, Igeta, Takeda, & Okitani, 2004), and those people who differentiated among the types of meat scored lamb's flavor stronger and with lower palatability (Rhee & Ziprin, 1996). Lamb flavor differs with age of the animal, feeding and genetics, among other factors (Arsenos et al., 2002; Duckett & Kuber, 2001; Sañudo et al., 2000, 2007). For instance, the odor and flavor of lamb from grass-fed or grain-fed animals is related to the incorporation of n-3 and n-6 polyunsaturated fatty acids into muscle (Sañudo et al., 2000). Meat from lambs fed on pasture or older lambs usually has an intense mutton odor and flavor, probably due to its higher content of α -linolenic acid (Díaz et al., 2005; Wood & Fisher, 1990) and its oxidation products, and may also have a strange and rancid flavor (Resconi, Campo, Font i Furnols, Montossi, & Sañudo, 2009) that some consumers probably dislike because it is not familiar (Font i Furnols et al., 2006, 2009). Sañudo et al. (2007), in a study involving 22 lamb types and 6 countries, highlighted two types of consumers according to their flavor preferences: those who preferred "milk or concentrate taste" and those who preferred "grass taste." The familiarity of consumers or habits of consumption have been important factors affecting flavor preferences and the acceptability of lamb meat. Furthermore, this lack of homogeneity in consumer preferences allows us to establish different segments of consumers within and between countries depending on their preferences for the taste of lamb from different origins, production systems or ageing time (Font i Furnols et al., 2006, 2009; Martínez-Cerezo, Sañudo, Medel, & Olleta, 2005).

Beef odor and flavor, and its acceptability or preference by consumers, are affected by genetics and feeding. As in lamb, factors such as fatty acid composition, which is linked with feeding, and the amount of intramuscular fat affect beef flavor. Grass-fed beef presented higher

off-flavors than grain-fed beef (Resconi, Campo, Font i Furnols, Montossi, & Sañudo, 2010). However, Resconi et al. (2010) reported that sometimes the flavor associated with grass-fed beef can be considered strange to those who lack familiarity with the taste. Realini et al. (2009) separated segments of consumers according to their preferences for flavor from grass-fed animals or animals fed with combinations of grass with concentrate. Furthermore, omega-3 and conjugated linoleic acid are ingredients that in general are considered healthy, and it has been reported that the enrichment of beef with one of these compounds increases consumer scores compared with conventional meat, while enrichment with both compounds seems not to affect at consumers' overall liking (Realini et al., 2013). Higher preference for corn-fed domestic beef in comparison to grass-fed Australian beef and barley-fed Canadian beef was reported by Sitz, Calkins, Feuz, Umberger, and Eskridge (2005), probably because of the familiarity of consumers with the flavor of domestic meat. Moreover, the flavor of barley-fed beef has a more livery, bloody and metallic after-taste than corn-fed beef (Jeremiah, Beauchemin, Jones, Gibson, & Rode, 1998).

Studying the effect of the sensory quality of pork on consumer preferences, Aaslyng et al. (2007) concluded that fried flavor was preferred in comparison with boiled and sour flavors. Moreover, Bryhni et al. (2003) highlighted the greater preferences for pork with low off-flavor and high tenderness and juiciness. One important off-flavor and off-odor of pork is related to its sex. Meat from intact males can present boar odor and flavor that is an important sensory defect related mainly to the presence of androstenone (α -androst-16-en-3-one, Patterson, 1968) and skatole (3-methylindole, Vold, 1970; Walstra & Maarse, 1970). Boar taint can be perceived either in fresh meat or in some pork products such as dry-cured ham (Bañón, Gil, & Garrido, 2003; Diestre, Oliver, Gispert, Arpa, & Arnau, 1990; Font i Furnols et al., 2008), especially by consumers who are sensitive to androstenone (Bonneau & Chevillon, 2012; Font i Furnols, Gispert, Diestre, & Oliver, 2003; Weiler et al., 2000), and it reduces pork acceptability (see review of Font-i-Furnols, 2012).

According to Morales et al. (2008), aged flavor, smell and salty taste are important traits affecting the purchase of dry cured ham. In fact, in an EU study, Resano, Pérez-Cueto, Sanjuán, et al. (2011) determined taste to be the main trait related with consumers' dry-cured ham overall satisfaction. Dry cured ham preferences for consumers are related to process characteristics such as processing period and smoking because they affect the volatile compounds and consequently the flavor (Pham et al., 2008). Thus, it is important to determine the best production, curing and drying conditions to produce the desired product and satisfy consumer demands. In Iberian pig, for instance, cured loins from pigs fed outdoors with acorns and grass had improved flavor and odor, as well as better appearance and texture than those fed a concentrate diet indoors (Soto et al., 2010) at least by consumers familiar with these type of products.

4. Marketing

Much of the information that consumers receive regarding meat and meat quality is provided through adverts, information campaigns, labels or brands. This information is used by consumers, together with other factors, to create their quality expectations, which in turn influence the choice of the product, purchasing decisions and willingness to pay. It has been shown that promotional campaigns can affect the consumers' expectation of quality and that aspects such as meat quality and origin become more important for consumers after information campaigns (Verbeke & Ward, 2006). Furthermore, to increase sales or to reach specific markets, several marketing strategies have been developed such as on-line shops, telemarketing or direct selling, among others. In this section we are going to focus only on two aspects, price and quality label, and mainly as they relate to in organic production systems.

4.1. Price

In this section an overall view of the perceived importance of price is provided. In this sense, price is an important extrinsic quality cue related with consumers' purchasing decisions, but though it has a positive effect on expected quality (Bello Acebrón & Calvo Dopico, 2000), its relationship with actual eating quality is not clear (Becker, Benner, & Glitsch, 2000) and it is affected by demographic characteristics (Reicks et al., 2011). In fact, Schnettler, Ruiz, Sepúlveda, and Sepúlveda (2008) reported a positive association between low beef prices and low quality because of the discounts offered for beef close to the expiration date. This association was not found by Bello Acebrón and Calvo Dopico (2000). Compared with other cues, price has been reported to affect meat perception after quality, taste, being hormone free and healthiness (Verbeke & Viaene, 1999).

Some studies showed that lamb price was the most important factor, compared with safety, quality, traceability and origin (Du Plessis & du Rand, 2012). Other studies have shown that lamb and beef price was the least important attribute affecting purchasing intention when compared with country of origin and feeding system, although a minority of consumers considered price the most important factor on purchasing intention, with the lowest (or in some cases medium) price being the most preferred (Font i Furnols et al., 2011; Realini et al., 2013). Similar results in beef were found by Mesías, Escribano, Rodríguez de Ledesma, and Pulido (2005) when price was compared with production system, origin and quality label and also in lamb (Bernabéu & Tendero, 2005), when price was compared with type of lamb, origin and certification. Corcoran et al. (2001) reported that low price was more important for some consumers, while it was less important for others. In fact, Sasaki and Mitsumoto (2004) reported a segment of consumers who preferred higher priced beef. These price preferences have been linked to consumer age and gender (Font i Furnols et al., 2011; Sasaki, Aizaki, Motoyama, & Mitsumoto, 2006). Thus, although price seems to not be the most important attribute when purchasing, usually lower prices are preferred and are probably especially important for a segment of consumers with low purchasing power or those for whom meat characteristics or type is not an important issue. In fact, high price is one reason that can explain, for instance, the low consumption of lamb in some countries where it is highly priced. Some people cannot afford to buy this type of meat very often and its consumption is only occasional, being replaced by other more affordable type of meat in most meals (Campo, Olleta, & Sañudo, 2008). However, in some other countries, lamb is the most popular meat, probably because the price is lower.

4.2. Quality labeling

Certification is an important attribute that can affect consumer preferences in one way or another, depending on the country. In some countries, most of the consumers prefer to buy meat from known butchers without veterinary stamps over meat that was certified by government veterinarians, probably because of distrust of government food safety enforcement (Imami, Chan-Halbrendt, Zhang, & Zhllima, 2011). Nevertheless, in countries where consumers are confident in governmental institutions that are responsible for certification, they place more trust in the certified labeling (Schleenbecker & Hamm, 2013). In this sense, quality labeling in terms of certified quality brands or seals of guarantee, as well as expiration date, are more interesting for consumers who also use it to infer expected beef quality (Verbeke & Ward, 2006). Additionally, lamb quality through certification was the most preferred (Bernabéu & Tendero, 2005), followed by quality through labeling and branding and finally by quality through origin (Du Plessis & du Rand, 2012). Furthermore, the label and brand of beef were quality cues signalling beef healthiness (Van Wezemael, Verbeke, de Barcellos, Scholderer, & Perez-Cueto, 2010). Moreover, quality labeling, such as Designation of Origin or Geographical Indication of Origin, is an important cue that positively influences consumers' purchasing intentions for beef (Mesías et al., 2005)

because it is related to the origin, the company that makes the product and the standards the product has to meet (Bello Acebrón & Calvo Dopico, 2000).

Another important aspect related to quality labels for Muslim consumers that live in non-Muslim countries in Western society is the certified halal label, which assures the halal authenticity of meat and meat products, as well as meat wholesomeness (Bonne & Verbeke, 2008). The importance of the certified halal label is higher in young and more acculturated female Muslims, who are also more willing to pay for it (Verbeke, Rutsaert, Bonne, & Vermeir, 2013).

Country of origin's effect on consumer preferences has been widely studied. It has cognitive, affective and normative aspects, and it is related with perceived quality and less related with probability to purchase. The effect of country of origin is higher in products from more developed countries than in less developed countries (Verlegh & Steenkamp, 1999). Most of the studies carried out in different countries showed the importance of country of origin and a preference for national beef (Realini et al., 2013, 2014; Schnettler, Vidal, Silva, Vallejos, & Sepúlveda, 2009; Schnettler et al., 2008) and lamb (Bernabéu & Tendero, 2005; Du Plessis & du Rand, 2012; Font i Furnols et al., 2011). Moreover, within domestic lamb, highland lamb meat is strongly preferred over plain/lowland meat either in Norway, Italy and Albania (Hersleth, Næs, Rødbotten, Lind, & Montealeone, 2012; Imami et al., 2011). This preference for local products is probably because consumers relate them to freshness, taste and high quality (Chambers, Lobb, Butler, Harvey, & Traill, 2007). Ethnocentrism is also a factor that may influence the choice of domestic products (Shimp & Sharma, 1987). This is probably one of the reasons why marketing strategies that value the proximity product have also been applied.

Information about organic production reaches consumers through the label or certification, although organic standards vary among countries (Braghieri & Napolitano, 2009). Organic production is usually related to food safety, nutrition, ethics, health, management and environmental aspects and thus, it generally increases consumer preference (Fernqvist & Ekelund, 2014). In general consumers were willing to pay more for organic products with certification (Kim, Suwunnamek, & Toyoda, 2008). The amount consumers were willing to pay depends on the type of organic certification and the country because consumers have different perceptions of trust, credibility, standards required for each label and awareness of the label (Janssen & Hamm, 2012). This finding was obtained with eggs and apples but probably could be generalized to meat and meat products. Furthermore, organic and free-range labels on meat increase its acceptability and desirability (De Boer, Boersema, & Aiking, 2008). A study showed that preferences of consumers regarding pig production are mainly influenced by maximum efforts to protect the environment and outdoor housing system (Verbeke et al., 2010). Some consumers had higher expectations of eating quality and were willing to pay more for pork labeled as 'organic' or 'free-range' pork compared with those labeled as 'conventional' or unlabeled. Nevertheless, when they tasted meat, the experienced quality was lower in organic pork compared with the conventional (Scholderer, Nielsen, Bredahl, Claudi-Magnussen, & Lindahl, 2004). It is suggested that one reason is that organic pork is less tender due to higher physical activity (Braghieri & Napolitano, 2009). Napolitano et al. (2010) showed that the perception of organic beef was higher than that of conventional beef when no information was provided. This may be related to differences in flavor because organic beef was raised on pasture. Furthermore, consumers also rank their expected liking of organic beef higher than conventional beef, indicating that they are considering beneficial effects of organic production on product quality and safety. However, in another study, similar sensory characteristics between organic and conventional beef were reported (Walshe, Sheehan, Delahunty, Morrissey, & Kerry, 2006). One aspect that has to be taken into account in organic meat is that its production is more costly than conventional, and price is an important factor to consider in this type of production. Thus this type of production is oriented to a specific segment of consumers because consumers' willingness to pay for organic meat depends on the region and their

lifestyle. Spanish consumers classified as 'likely' and 'organic food' consumers are willing to pay between 14% and 19% more for organic red meat (Gil, Gracia, & Sánchez, 2000). Nevertheless, this percentage was much lower (5%) in other European populations, with only one-fifth of general consumers willing to pay 20% more for organic pork compared with conventionally produced pork (Dransfield et al., 2005).

An aspect related to organic production is the production system because it uses pasture and outdoor areas (Braghieri & Napolitano, 2009). Regarding production systems, pork reared outdoors was slightly juicier than pork reared conventionally, but no differences in tenderness, odor and flavor were found (Lebret et al., 2006). Regarding lamb and beef, grass-based production system are usually most preferred by consumers compared with concentrate-based production system (Font i Furnols et al., 2011; Realini et al., 2013). This is probably because the beliefs and expectations toward grass-fed meat are related with healthier, tastier, more natural and environmentally friendly meat. Nevertheless, the expected quality does not always fit experienced quality, especially for grass-fed lamb (Font i Furnols et al., 2011).

5. Conclusions

Multiple determinants shape consumer behavior toward meat and meat products. Thus, consumers' preferences, behavior and their perception of meat and meat products are heterogeneous and depend not only on the appearance and sensory properties of the meat but also on psychological and marketing aspects. Understanding this is a complex issue. A better understanding of this complexity may help improving the competitiveness of the meat industry for instance, by means of effective strategies to provide information: labels and information that can increase consumer acceptance of more convenient, healthy and environmentally friendly choices might be particularly effective. In addition, more information about meat and meat culture could create more accurate expectations, thus reducing uncertainty and tying expectations to tangible product characteristics. Both of these approaches, cultivating positive attitudes and ensuring that meat satisfies consumer expectations, should increase the competitiveness of meat and meat products and their market share over alternative sources of protein.

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