CONSUMER PERCEPTIONS OF MEAT. UNDERSTANDING THESE RESULTS THROUGH DESCRIPTIVE ANALYSIS

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ABSTRACT

Consumer perceptions of meats are investigated through qualitative and quantitative consumer studies. Qualitative studies add value and meaningful information to quantitative studies of meat. Among the important issues to consider in designing a quantitative consumer test for meats is the selection of terms to be used in a questionnaire. Additional terms besides tenderness, juiciness and flavor liking should be used to fully investigate consumer perceptions of meats. The limitations of consumer language is discussed. These limitations may be overcome through consumer - descriptive studies. These studies combine descriptive/ sensory laboratory data with consumer information to decode consumer responses. The applications of this approach are: to achieve a more thorough interpretation and understanding of consumer responses, to provide more specific product guidance, to enable the prediction of consumer responses based on internal data (e.g., descriptive, instrumental), and to study different consumer segments.

INTRODUCTION

Food products are developed, produced and marketed to appeal to the consumer. Ultimately, the success of a product depends on its acceptance to the consumer, who is the user or potential user of the product and thus the one who purchases the product (Moskowitz, 1985). Therefore, professionals in all consumer products industries study consumer perceptions and responses to assess the success of a new product, a research parameter, a formulation change, a new process, etc. If a product is not well liked by consumers, we have not succeeded in our research or manufacturing project.

We professionals working in the meat industry and field also have to be involved in consumer studies to collect and understand the consumer responses to the meat products and variables we are studying (Watts and Cliplef, 1976; Cross and Stanfield, 1976; Savage et al., 1990). Ultimately, we have to ensure that the meat products we work on have high consumer acceptance.

Consumers consider several of a food product's characteristics to determine its acceptance, such as its sensory characteristics (the way the product looks, tastes and feels like), its nutritional value, its convenience and its impact on the user's health. These parameters occupy different levels of importance depending on the product. In meats and meat products, the sensory, health related and nutritional properties are the most important product parameters (Richardson et al., 1994; Harrington, 1994). For some consumers, the health related issues may be of most importance and therefore the ones determining the consumer's interest in and/or acceptance of the meat product (Capps et al., 1988; Unnevehr and Bard, 1993). However, for most consumers of meat products, the way the products tastes and looks like (i.e., the sensory properties) are the most important motivators for liking and purchasing a meat product (Schweigert, 1963).

Therefore, this paper will focus on the sensory properties of meats at several levels. At one level, consumer studies of meats, when conducted with one or several cultures or consumer populations will be discussed. At another level, the evaluation of meat sensory properties in the laboratory by an expert panel will also be covered. These studies provide a picture of the true sensory characteristics of the meat products we are studying. Therefore, these studies have many research applications and can also be used to better understand consumer results.

CONSUMER STUDIES OF MEATS

Consumer perceptions of meats are investigated through qualitative and quantitative studies. Qualitative studies involve the study of factors that motivate consumer opinions and behaviors. Consumer attitudes, perceptions and beliefs that may explain the reasons for people's products choices are explored. Even though quantitative data are not obtained in these studies, qualitative research has an exceptional value, since the consumer can be probed to obtain information not easily obtained in quantitative studies. In qualitative studies, consumers either participate in a group discussion (6-10 consumers) or are interviewed on

an individual basis. The characteristics, advantages and disadvantages of these studies have been covered elsewhere (Goldman, 1962; Axelrod, 1975; Reynolds and Johnson, 1978).

Because of the nature of qualitative research, there are a variety of sensory issues that may be addressed in meat studies (Table 1). This qualitative information can be the most important data that a researcher needs to collect and cannot be easily measured though a written questionnaire (i.e., in a quantitative study). The qualitative studies do not replace quantitative ones, qualitative studies complement the latter.

Table 1. Examples of sensory issues that could be investigated in qualitative consumer studies of meats

- What did you specifically liked and disliked about this meat product?
- How did you cook this meat product?
- Please explain why this color of meat is more appealing than this other color.
- Please explain why this steak looks greasy to you.
- Please tell me more about why this amount of visible fat is unacceptable to you.
- Let us talk about why in your opinion meat product 783 is more tender than product 245.
- Let us talk about why your family preferred this meat patty over all others.

Quantitative studies on the other hand are geared to collect data that can be summarized and analyzed statistically. Ultimately, researchers need this type of information and the power of statistics to make product decisions. However, if the qualitative research discussed above is conducted in conjunction with quantitative studies, more complete information on consumer responses is obtained.

Quantitative consumer studies have also been described in the literature (Moskowitz, 1983; Moskowitz, 1985; Stone and Sidel, 1993). The main characteristics of these tests for meat products are shown in Table 2. The reader is encouraged to consider these points when designing and conducting a sound consumer study of meats. As in any consumer study, the participant should be the naïve user or potential user of the product, who has been carefully recruited based on this and other demographic criteria (e.g., age, frequency of use, etc.). The participating consumers should not be panelists who have been trained to evaluate products in the laboratory set up. The number of consumers is usually large (perhaps above 50) to provide valid results. Also, since a large number of consumers participates, careful consideration has to be given to the sample amount, consistency and preparation needed for a large group of people. Considering the large variability that exists in meat products, this represents a true challenge. However, researchers need to control this parameter as best as possible to obtain reliable results.

Another one of the main challenges of quantitative consumer studies of meats and any product is the questionnaire design, especially the selection of attributes to be evaluated by consumers (Table 2). Consumers will always answer questions in a written ballot, even if the attributes are not understood or they are not present in the product. Therefore, for the data to be sound and valid, attributes have to be carefully selected in order for consumers to provide meaningful information. This means using consumer terms and not a technical product lexicon, when designing a questionnaire (Muñoz, 1997).

For meat products, the selection of attributes depends on the type of meat product and the type of study and/or variables being studied. The readers are encouraged to consult the literature for examples of the sensory attributes most often

investigated in consumer meat studies (Cross and Stanfield, 1976; Watts and Cliplef, 1976; Huffman et al., 1981; Griffin et al., 1985; Savage et al., 1990; Parrish et al., 1991; Ruiz et al., 1993). For example, for red meats most consumer studies include tenderness, juiciness, color and flavor liking/desirability (Cross and Stanfield, 1976; Mendenhall and Ercanbrack, 1979; Huffman et al., 1981; Medeiros et al., 1987; Griffin et al., 1985; Broekhuijsen and Willigen, 1990; Parrish et al., 1991).

Table 2. Most important characteristics of quantitative consumer studies of meats

- The naïve user or potential user of the meat product participates
- A relatively large group of consumers participates (depending on the statistical power required)
- Careful consideration to the meat product amount, consistency and preparation for the large number of participating consumers must be given.
- A written questionnaire is used
- The questionnaire presents attributes and scales to collect the perceived levels of sensory attributes by consumers
- Sensory questions may include overall liking, liking and perceived intensity of attributes (e.g., juiciness, tenderness), and preference
- The selection of attributes in the questionnaire is critical
- Data are statistically analyzed

We can ask ourselves if these attributes are sufficient to provide us with all the information we need on the meat product we are studying. The answer from some researchers may be negative. Similarly, it is this author's opinion, that there are perhaps more attributes that should be investigated in consumer studies of meats. For example, we may want to know more details about the flavor characteristics of meats as perceived by consumers. Do consumers perceive oxidation notes, such as warmed over flavor notes? How do these notes affect acceptance? However, as much interest as we may have in these attributes and their consumer perception, we cannot ask consumers to rate these complex flavor attributes.

At this point, the relative limitation of consumer information and the need to conduct other studies need to be discussed. Consumers are not - and should not be - trained/expert panelists. Without training, a person has limited vocabulary to express his/her perceptions. Therefore, consumers often cannot accurately described their perceptions and most importantly may not be able to express the changes the product needs to be better liked (Muñoz, 1997). Because of this limitation, we researchers often cannot ask consumers their opinion on the complex sensory attributes we are interested in. Rather, we need to find other ways to achieve our goal: obtain the consumer responses to the products we work with and obtain accurate product guidance to be able to formulate or reformulate products that will be acceptable by the consumer. This objective can be met when both consumer and descriptive studies of the meat product are conducted. This approach, the execution of a consumer-descriptive study, will be discussed below. Despite the limitations we encounter with consumer vocabulary, it is in our best interest as researchers to ask the consumer as many attributes as possible, in order to obtain the most complete consumer information. These attributes need to be simple and be understood by consumers. Table 3 shows and example of a consumer questionnaire for the evaluation of steaks. In this example, overall liking questions (e.g., overall liking, liking of appearance, flavor and texture) are asked, as well as a few simple attributes for consumers to indicate how intense that attribute is and the liking of the attribute in that product.

Table 3. Example of a consumer questionnaire for steaks

UNCOOKED PRODUCT	Liking	Intensity
Overall appearance	*	
Color	*	
Visible Fat	*	*
Size	*	*
Thickness	*	*
Overall Aroma	*	
Freshness	*	*
COOKED PRODUCT	**Liking**	**Intensity**
Overall (all characteristics)	*	
Overall Appearance	*	
Color	*	
Visible Fat	*	*
Size	*	*
Juiciness	*	*
Overall Flavor	*	
Beefy/Meaty	*	*
Freshness	*	*
Overall texture	*	
Visual		
Ease of cutting	*	*
Juiciness (while cutting)	*	*
Degree of doneness	*	*
Oral		
Tenderness	*	*
Firmness	*	*
Juiciness	*	*
Chewiness	*	*
Oiliness/greasiness	*	*

CROSS CULTURAL CONSUMER STUDIES OF MEAT

There has been a strong trend in the last decades for most industries to expand their horizons and compete on a global basis. Similarly, scientists from different fields have increased their interaction and shared information at a global level (Dziezak, 1987).

We, professionals in the meat industry and field are no exception to this trend and we have become more involved in conducting research and projects with a global perspective. In our industry and field, it means assessing the quality of the meat products we produce or study by consumers of different countries or cultures. As for most products, the acceptance of meats is unique to different countries or cultures (Barton, 1984; Mdafri and Brorsen, 1986; Ladele et al., 1996) In conducting cross cultu-

ral consumer research we need to pay attention to all the above points discussed for consumer studies. Since we are testing a culture or in a country that we may not know well, another level of complexity is added to these consumer studies.

New challenges are posed to the researcher conducting these types of tests. The most important ones are listed in Table 4. Knowing the cultural nuances and language of the population being tested are necessary in order to conduct a sound study. Therefore, these studies involve the close collaboration of several researchers, who know the cultures and/or countries being studied. Committee E18 on Sensory Evaluation of the ASTM (American Society for Testing and Materials) is currently working on a manual that will cover these issues extensively for different cultures across Europe, North and South America, and Asia.

Table 4. Aspects to consider in designing and conducting cross cultural consumer research

- Language(s) of culture
- Psychological factors affecting scaling
- Etiquette issues of culture
- Religious issues of culture
- Subgroups of population within culture
- Special consumer recruitment procedures
- Types of incentives
- Product shipment and storage
- Government regulations for product shipment and use

DESCRIPTIVE/SENSORY LABORATORY STUDIES OF MEATS

A brief discussion of this technique is warranted in order to understand its value when used by itself and together with consumer tests. Descriptive analysis conducted in conjunction with consumer tests allow us to overcome the limitations of consumer information.

Descriptive analysis is the sensory technique geared to qualitatively and quantitatively characterize the sensory attributes of a product by a highly trained group of panelists. Qualitatively, the panel documents the specific attributes/words/characteristics that describe the products being studied. For meat products and other foods a descriptive panel describes all appearance, flavor and texture characteristics of the product. Quantitatively, the panel evaluates the intensity/strength at which all these attributes are perceived. There are several descriptive methods, which differ in their approach and philosophy (Caul, 1957; Brandt et al., 1963; Stone et al., 1974; Williams et al., 1981; Williams and Langron, 1984; Keane, 1992; Muñoz and Civille, 1992; Muñoz et al., 1992, Stone, 1992). Except for the free choice profile method (Williams et al., 1981, Williams and Langron, 1984) all descriptive techniques require the careful selection and training of a panel.

In the consumer studies described above, only the consumer, who is the user or potential user of the product participates. This consumer is naïve, not trained and qualifies in tests based on meeting several demographic criteria set by the researcher (e.g., purchasing and consuming a specific meat product with certain frequency, belonging to a certain age category, with children in the household, etc.). In descriptive tests, the panelists who have been involved in a training program participate. Despite being users of the meat product being studied, panelists cannot be considered consumers, since their responses are not naïve due to their panel training.

Researchers in the food industry and therefore in the meat industry benefit from applying descriptive analysis in their work. This sensory technique is used in many research and development applications, such as the documentation of controls, product targets, competitors, the assessment of research variables on the appearance, flavor and texture of products, the study of product changes due to shelf life, process or formula changes, etc. Descriptive analysis is also used in QA/QC and Marketing/ Market Research applications (Stone and Sidel, 1993).

Descriptive analysis has been used extensively in the meat industry and there are many studies published in this area. These studies range from research using poor sensory methodology (i.e., evaluating only a limited number of attributes such as tenderness and juiciness, asking trained panelists to rate liking or preference in this laboratory set up, etc.) to those where sound descriptive principles have been used. This sound methodology involves using a well trained panel, following careful preparation and presentation of the samples, and developing and using a technically sound lexicon to describe the sensory characteristics of meats.

Table 5 shows examples of sound flavor and texture lexicons of two meat products, beef and chicken. Part of the information is taken from several papers published on descriptive analysis of meats (Johnsen and Civille, 1986; Lynch et al., 1986; Berry and Civille, 1986; Lyon, 1987; Love, 1988; Lyon and Lyon, 1990; Chambers et al., 1992; Bett, 1993; Miller et al., 1996). The use of descriptive analysis to better understand consumer responses

Table 5. Flavor and texture lexicons of beef and chicken

	BEEF	CHICKEN
FLAVOR		
Aromatics		
		Chickeny
	Cooked beef /brothy	White chicken meat
	Cooked beef fat	Dark chicken meat
	Browned	Fat/skin
	Liver/organy	Browned
	Serum/bloody	Liver/organy
	Grainy	Serum/bloody
	Cardboard	Cardboard
	Painty	Painty
Basic Tastes		
	Sweetness	Sweetness
	Saltiness	Saltiness
	Sourness	Sourness
	Bitterness	Bitterness
Feeling factors		
	Metallic	Metallic
TEXTURE		
Surface properties		
	Oiliness/Wetness	Oiliness/Wetness
	Roughness	Roughness
Partial compression		
	Springiness	Springiness
First bite		
	Firmness/Hardness	Firmness/Hardness
	Cohesiveness	Cohesiveness
	Juiciness/Moisture release	Juiciness/Moisture release
	Uniformity of bite	
Chew down		
	Cohesiveness of the mass	Cohesiveness of the mass
	Uniformity of the mass	Uniformity of the mass
	Juiciness	Juiciness
	Gristle Fibrousness	
	Connective tissue	
Residual		
	Toothpack	Toothpack
	Number of particles	Number of particles
	Oiliness/Greasiness	Oiliness/greasiness

It has been mentioned that consumer research and descriptive analysis by themselves serve very important roles. Consumer research provides us with the information on consumer perception and acceptance that only consumers can provide. However, consumers because of their lack of training and limited vocabulary cannot provide us with extensive product information. A

descriptive panel on the other hand provides the accurate and detailed product description. However, because of their training, expert panelists are not qualified to give a naïve consumer response. Therefore, to gain the complete product information, both consumer and descriptive analysis should be used (Muñoz, 1997).

The reader is encouraged to consult the literature on this topic to further understand the advantages of combining the two techniques in a consumer - descriptive study (Martens et al., 1983, Jones et al., 1989; Pigott et al., 1989; Muñoz et al., 1996; Popper et al., 1997). The main applications of consumer - descriptive studies are (Muñoz, 1997): to achieve a more thorough interpretation and understanding of consumer responses, to provide more specific product guidance, to enable the prediction of consumer responses based on internal data (e.g., descriptive, instrumental), and to study different consumer segments. These applications were demonstrated for a meat product (hot dogs) by Muñoz and Chambers (1993). One of the studies showed the sensory product characteristics that this type of meat product needs to have to ensure high consumer acceptance. These characteristics are expressed in descriptive terms, which are more detailed than the consumer lexicon. For example, Muñoz and Chambers (1993) published that a hot dog product with high consumer acceptance needs to have high intensity of smoke, cured meat, sweet aromatic, sweetness, saltiness, moisture release, cohesiveness, cohesiveness of the mass, residual oiliness and fat aromatic. On the other hand, a highly acceptable product needs to have low intensity of skin awareness, firmness of the skin, grain aromatic, poultry, green herbs, pepper, onion, garlic and speckles. This detailed guidance on how to formulate or reformulate this meat product would not have been obtained from consumers, where the only attributes that could be asked for this meat predict were color, size, hot dog flavor, spiciness, firmness, chewiness, skin awareness, greasy/oily, spicy, smoky and salty.

Consumer - descriptive studies in other meat products need to be conducted. Similar to the hot dog study by Muñoz and Chambers (1993), these research studies unveil the important product characteristics that drive consumer acceptance of meats. In addition, these types of studies should be completed to have a better understanding of meat attributes as perceived by consumers.

REFERENCES

Axelrod, M.D. (1975). Marketing News., 3, 10.

Barton, R.A. (1984). S. Afr. J. Anim. Sci., 14 (4), 152.

Berry, B.W. and Civille, G.V. (1986). J. Sensory Stud., 1, 15.

Bett, K.L. (1993). Food Technol., 47 (11), 121.

Brandt, M.A., Skinner, E.Z. and Coleman, J.A. (1963). J Food Sci., 28, 404.

Broekhuijsen, M.L., Willigen, J.D. van. (1990). Meat Sci., 28 (2), 159.

Capps, O. Jr., Moen, D.S., Branson, R.E. (1988). Agribusiness, 4 (6), 549.

Caul, J. F. (1957). Advances in Food Research, 7(1), 1.

Chambers, E., IV., Bowers, J.R. and Smith, E.A. (1992). J. Food Sci., 57, 521.

Cross, H.R. and Stanfield, M.S. (1976). J. Food Sci., 4, 1257.

Dziezak, J.D. 1987. Food Technol., 41 (9), 119.

Goldman, A.E. (1962). J. of Marketing, 7, 61.

Griffin, C.L., Stiffler, D.M., Smith, G.C. and Savell, J.W.(1985). J.Food Sci., 50 (1),165.

Harrington, G. 1994. Meat Sci., 36 (1), 5.

Huffman, D.L., Cross, H.R., Campbell, K.J. and Cordray, J.C. (1981). J. Food Sci., 46, 34.

Johnsen, P.J. and Civille, G.V. (1986). J. Sensory Stud., 1, 99.

Jones, P.N., MacFie, H.J.H. and Beilken, S.L. (1989). J. Sci. Food Agric., 47, 113.

Keane, P. (1992). In: ASTM Manual series MNL 13. Manual on descriptive analysis testing, ed., R. Hootman. American Society for Testing and Materials, West Conshohocken, PA.

Ladele, A.A., Joseph, K., Omotesho, O.A., Ijaiya, T.O. (1996). Int. J. Food Sci. Nutr., 47 (2), 141.

Love, J. (1988). Food Technol., 42(6), 140.

Lynch, N.M., Kastner, C.L., Caul, J.F., and Kropf, D.H. (1986). J. Food Sci., 51, 258.

Lyon, B.G. (1987). J. Sensory Stud., 2, 55.

Lyon, B.G. and Lyon, G.E. (1990). Poultry Sci., 69, 329.
Martens, M., Martens, H., and Wold, S. (1983). J.Sci. Food Agric., 34, 715.
Mdafri, A., Brorsen, B.W. 1993. Agric. Econ., 9 (2), 155.
Medeiros, L.C, Field, R.A., Menkhaus, D.J. and Russell, W.C. (1987). J. Sensory Stud., 2, 259.
Mendenhall,V.T. and Ercanbrack, S.K. (1979). J. Food Sci., 44 (4), 1063.
Miller, R.K., Rockwell, L.C., Lunt, D.K., and Carstens, G.E. (1996). Meat Sci., 44 (4), 235.
Moskowitz, H.R. (1983). Product Testing and Sensory Evaluation of Foods, Food and Nutrition Press, Inc., Connecticut.
Moskowitz, H.R. (1985). New Directions for Product Testing and Sensory Analysis of Foods, Food and Nutrition Press, Inc., Connecticut.
Muñoz, A.M. and Civille, V. G. (1992). In: ASTM Manual series MNL 13. Manual on descriptive analysis testing, ed., R. Hootman . American Society for
Testing and Materials, West Conshohocken, PA.
Muñoz, A.M. and Chambers, E. IV. (1993). Food Technol., 47 (11), 128.
Muñoz , A. M., Szczesniak, A. S., Eistein, M. A. And Schwartz, N. O. (1992). In: ASTM Manual series MNL 13. Manual on descriptive analysis testing, ed., R. Hootman. American Society for Testing and Materials, West Conshohocken, PA.
Muñoz, A.M., Chambers, E. IV. and Hummer, S. (1996). J. Sensory Stud., 11, 261.
Muñoz, A.M. (1997). In ASTM Manual 30. Relating consumer, descriptive and laboratory data to better understand consumer responses., ed., A.M. Muñoz. American Society for Testing and Materials, West Conshohocken, PA
Parrish, F.C., Jr., Boles, J.A., Rust R.E. and Olson D.G. (1991). J. Food Sci., 56, 601.
Pigott, J.R., Sheen, M.R. and Guy, C. (1989). In: Flavors and off Flavors, ed., G. Charalcambous. Elsevier Science Publishers B.V., Amsterdam.
Popper, R., Heymann, H. and Rossi, F. (1994). In: ASTM Manual 30. Relating consumer, descriptive and laboratory data to better understand consumer responses., ed., A.M. Muñoz. American Society for Testing and Materials, West Conshohocken, PA.
Reynolds, F.D. and Johnson, D.K. (1978). J. of Advertising Research, 6, 21.
Richardson, N.J, MacFie, H.J.H., Shepherd, R. 1994. Meat Sci., 36 (1/2), 57.
Ruiz, C.F., Higginbotham, D.A., Carpenter, J.A., Resurreccion, A.V.A, Lanier, T.C. (1993). J. Anim. Sci., 71 (10), 2654.
Savage, A.W.J., Donnelly, S.M., Jolley, P.D., Purslow, P.P., Nute, G.R. (1990). Meat Sci., 28 (2), 141.
Schweigert, B.S. (1963). Food Nutr. News, 35, 1.
Stone, H. (1992). In: ASTM Manual series MNL 13. Manual on descriptive analysis testing, ed., R. Hootman. American Society for Testing and Materials, West Conshohocken, PA.
Stone H. And Sidel, J. L. 1993. Sensory Evaluation Practices. 2nd ed. Academic Press, Inc. Orlando, Fl.
Stone, H., Sidel, J. , Oliver, S., Woolsey, A. and Singleton, R.C. 1974. Food Technol., 28 (11), 24.
Unnevehr, L.J. and Bard, S. (1993). J. Agric. Resource Econ., 18, 288.
Watts, D.R. and Cliplef, R.L. (1976). J. Inst. Can. Technol. Aliment., 9, 151.
Williams, A. A., Baines, C. B., Langron, S. P., and Collins, A. J. (1981). In: Flavour '81, ed., P. Schreier. Walter de Gruyter, Berlin.
Williams, A. A. and Langron, S. P. (1984). J. Sci. Food Agric., 35, 558.

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