

Evaluating the Flavor of Meat

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Importance of Meat Flavor

The flavor of meat and meat products is critical to their acceptance. "Taste", price, and healthfulness were identified by the National Research Council (1988) as three primary motivators related to meat purchase and consumption, but if "taste" quality was lacking, price and healthfulness were irrelevant; people would not purchase the product. Although research to ensure a safe food supply has received much attention including that of meat researchers, the sensory quality of the product is still the number one reason many consumers select the specific meats they do.

Consumers generally eat the foods they like, including meat, and reject foods they dislike; sensory properties have the greatest impact on those likes and dislikes (Booth, 1990). Consumers expect red, meaty, tender, juicy steaks and firm (not tough) frankfurters with a blended cured meat flavor and a pale pink/brown color. Schweigert (1963) described the important qualities of meat as flavor, color, texture, nutritive value, and wholesomeness. Those factors remain today as motivators of purchase and consumption. People continue to like the flavor, the texture, and the variety of sensory experiences they get from meat of different animals and from muscle foods processed and prepared by many methods.

Sensory Profiling of Meat Flavor

Specific meat flavors are critical to acceptance although they often are seen as difficult to identify and quantify using sensory methods. However Caul (1957a), using the flavor profile method developed specifically to document flavor characteristics and intensities of food (Caul, 1957b; Caul et al., 1957), began a history of describing specific meat flavors. Later articles (for example, Gardze et al., 1979; Berry et al., 1980) characterized meat products using specific flavor terminology, but without defining and referencing that vocabulary.

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Chemicals Associated with Specific Meat Flavors

A number of studies have examined the chemicals associated with specific meat flavors. For example, Shaikh (1984) described thiazoles and thiols as associated with "roasted" flavor, pyrazines in "brothy" or "grilled" flavors, and tetrathiane in "mutton" flavor. Authors such as White et al. (1988) examined the chemical compounds and related them to meat flavor and then to consumer acceptance. For example, those authors found that when 2-thiobarbituric acid values (malonaldehyde) in precooked round steak reached levels commonly associated with noticeable oxidized flavor, consumer acceptability scores were lower than those for fresh steak. Authors such as Giffiths and Patterson (1970) reported on the human response to the chemical (androstenone) responsible for boar taint.

Specific Sensory Properties of Meat Flavor

In the late 1980's and 1990's, the flavor of meat and effects of various additives or processing methods have been more extensively characterized, defined, and/or referenced by a number of authors (Johnson et al., 1986; Lynch et al., 1986; Lyon, 1987; Goetsch, et al., 1990; Chambers et al., 1992; Munoz and Chambers, 1993; Munoz et al., 1996; Luchsinger et al., 1996; Lyon and Cville, 1996; Beggs et al., 1997; Luchsinger, et al., 1997).

A variety of attributes are used to describe the flavor of meat including attributes associated with specific animals (e.g. beef, pork, lamb identity), raising the animal/quality grades (e.g. gamey, grainy/cowy, grassy; see Berry et al., 1980 or Lyon, 1987, for example), processing (e.g. sour, animal-hair, burnt; see Luchsinger et al., 1996 for example), packaging (e.g. chemical, ammonia, plastic; see Luchsinger et al., 1996 or Luchsinger, et al., 1997, for example), preparation (e.g. bloody/serumy, browned, roasted, scorched; see Bowers and Goertz, 1966, for example), formulation (e.g. liver/organ, various spice flavors, soy; see Gardze et al., 1979, Lynch et al., 1986, Munoz and Chambers, 1993, or Beggs et al., 1997 for example), and storage (e.g. cardboard, painty, rancid; see Goetsch, et al., 1990, Chambers et al., 1992, or Spanier et al., 1992, for example).

Sensory Methods for Measuring Meat Flavor

In each of the research studies the basic method used was sensory descriptive analysis. Although the specific procedure varied in those studies, common to all studies was the determination of and scoring of the intensity of specific sensory characteristics, which is generic to all descriptive sensory methods (Hootman, 1992).

Flavor Profile

Two primary methods are used in studies of meat flavor: profiling and attribute scaling. With profiling (Caul, 1957; Keane, 1992), the perceptible factors are identified, described, and references are established as anchors. Attributes are given consensus numerical scores. Profiling requires a highly trained descriptive panel and often requires a longer testing time than attribute scaling methods. However, the method provides advantages in some situations. When it is important to identify the time sequence in which attributes appear, profiling is the method of choice. For example, the sequence of flavor attributes can change in products that have textural changes and release juices at different rates. When small differences or nuances may exist, profiling often is better than attribute scaling at identifying those very small differences. For example, the subtle differences in flavor caused by differing methods of aging often is more easily described using profile methods. When the attributes, rather than the intensities are different among products, profiling may provide a more complete picture. Studies of fabricated meat products, where the seasonings change dramatically between products, usually are more fully described using a profile method.

Because the scores in the flavor profile method are consensus measurements, typical analyses such as t-tests or analysis of variance are not used to find differences among products because different scores (e.g. 3 and 4) are different by their nature. The scores can be used in other analyses such as regression, cluster analysis, principal components analysis, or other multivariate techniques to "map" competitive products or to better understand consumer acceptance scores.

Attribute Scaling of Meat Flavor

Attribute scaling (see for example, Stone, 1992; Munoz and Civille, 1992) also involves the detection, identification, and description of the sensory aspects of a product by trained panels. Often these aspects include more than flavor and include appearance and texture parameters as well. This method is used best when products contain many of the same attributes but the attributes differ markedly in intensity, resulting in a different and distinctive sensory picture.

The orientation of the panel for this method often consists of studying a variety of related products as well as the test samples. The panelists identify and define the attributes, and establish references or anchors on the scale in many of the methods.

For testing, a ballot could have any of several different types of scales and typically has 10-20 attributes, although some projects have fewer if only a few attributes are of

importance. Typically, 3-5 blind replications are done and the data are analyzed statistically to determine differences among products. When many products are involved, attribute scaling often takes a shorter amount of time than profiling.

Summary

The flavor of meat is important and can be measured specifically and repeatably by sensory methods. A vast array of attributes responsible for flavor quality have been studied by various authors and should be evaluated whenever the flavor quality of the meat or meat product is important.

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