AROMA OF FRESH AND PROCESSED MEAT ASSESSED BY AN ELECTRONIC NOSE

Gabriela María Grigioni, Carlos Alberto Margaría and Norma Ana Pensel
Instituto de Tecnología de Alimentos - Centro de Agroindustria - INTA. C.C: 77, (1708) Morón, Buenos Aires, Argentina.

Food sensory attributes are the most important criteria that drive preference and purchasing consumer decision. Currently, sensory evaluation and headspace/direct gas chromatography/ mass spectrometry analysis are carried out to determine flavor quality for both, raw material and final product. The applicability of human subjects, either trained or untrained assessors, require an integral comprehension of the factors that may influence their sensory responses (Guinard, 1994).

New specific techniques had become available to assess flavour quality (Karel, 2000). Electronic Noses (E-noses) are being widely used for quality control and their potential applications in food odour analysis are constantly developed. Data interpretation is carried out using chemometrics techniques comprising a variety of multivariate analytical methods. Other systems also incorporate for data analysis artificial neural networks (ANN) in their software facilities (Marsili, 1999).

Unacceptable flavour and odours development is one of the most prevailing reasons for consumer rejection either in raw, processed or packaged food (Mottram, 1998). Generally the detection threshold levels of volatile compounds, that are important for being either responsible of a characteristic flavor or for taints and off-flavours, are bellow parts per billion range. For example, Gray et al. (1996) outlined a classification of undesirable meat flavours that are namely related to oxidative rancidity, processing-induced and feed-derived flavours, among others. Especially in raw meat, variations in flavour and/or odour arise from animals fed on different finishing-diets, e.g. pasture or feedlot,

Regarding to meat feed-derived flavours, these are related to consumer behaviour like consumer preference for meat from grass or grain-fed animals. Therefore, when a particular population is the target of such a product, this should be taken into account to fulfil consumers' preference. In the Food Technology Institute (Instituto Tecnología de Alimentos, ITA) of INTA, a research has been carried out to establish the influence of different diets on enzymes and natural antioxidants related to the oxidative stability of Argentine meat products. As a part of this major project, odour evaluation by an E-nose (AromaScan A32/50S, Osmetech UK) was performed to determine differences in raw meat aroma from steers fed pasture and grain diets with and without vitamin E supplementation. In this study aroma results showed that E-nose technique could discriminate different diets odour profiles in fresh beef from the beginning of refrigerated storage. At this time, no difference was observed between supplementation in each feeding regime. Although it is expected that when storage progresses this differentiation would be achieved as oxidation process develops (Grigioni et al., 2000). These aroma results were in accordance with differences between basal diets observed in flavour precursors such as α-tocopherol, carotenoids and fatty acid composition at the beginning of storage (Descalzo et al., 2000).

In regards to cooked meat one of the major sources of off-flavour found is warmed over flavour (WOF) (Tims & Watts, 1958). WOF includes odours and tastes commonly described as "stale", "cardboard-like", "painty", "rancid", "bitter", and "sour" among others (St. Angelo et al., 1987). At ITA a research project is being carried out to develop new processes for ready-to-eat beef using vacuum cook-in-bag/tray technology (VCT) applying low temperature - long time thermal treatments (Vaudagna et al., 2000). Sous-vide products are mentioned in the literature to possess high sensory and nutritional quality. As part of this project, a study was conducted to establish E-nose methodology suitable for VCT processed beef, to detect and classify samples with WOF odour during refrigerated storage. E-nose data could successfully differentiate the aroma alteration of VCT processed beef during storage. The results showed that processed beef samples up to 20 days of storage clustered together and samples for 34 to 45 days of storage assembled in a different group. Also, E-nose correctly classified samples with a specific aroma. Samples with more than 20 days of storage were recognised as presenting WOF odour when compared to WOF odour standard samples. E-nose sample classification was in agreement with thiobarbituric acid reactive substance (TBARS) results. For samples stored 20 days or more, an increment of TBARS values at levels commonly associated with oxidised flavour was observed (Grigioni et al., 2000).

As a conclusion it might be pointed out that among the new technologies that use artificial intelligence, E-nose technique provides a powerful, non-destructive method to odour analysis of fresh and processed meat, making it a valuable complement to traditional techniques commonly used in food odour research; and open a new approach in food odour studies, providing another dimension to the understanding of the subtle relationships between flavor components and flavor perception.

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