



A procedure for sensory detection of androstenone in meat and meat products from entire male pigs: Development of a panel training

M.^a. Dolores Garrido ^{a,*}, Macarena Egea ^a, M.^a. Belén Linares ^a, Beatriz Martínez ^b, Ceferina Viera ^b, Begoña Rubio ^b, Francesc Borrissier-Pairó ^c

^a Department of Food Science and Technology, Veterinary Faculty, University of Murcia, Espinardo, 30071 Murcia, Spain

^b Estación Tecnológica de la Carne, Instituto Tecnológico Agrario, Junta de Castilla y León, Guijuelo 37770, Spain

^c IRTA-Monells, Product Quality Program, Finca Camps i Armet, E-17121 Monells, Girona, Spain

ARTICLE INFO

Article history:

Received 11 December 2015

Received in revised form 22 July 2016

Accepted 25 July 2016

Available online 27 July 2016

Keywords:

Boar taint

Sensory

Training

Meat

Meat products

Androstenone

ABSTRACT

This study represents a proposal for training sensory panels in androstenone (AND) perception in meat and meat products. The procedure consists of four main parts: (1) selection and training of a sensory panel (11 panelists) using standards with Vaseline oil media as carriers of AND and skatole (SKA); (2) developing a training method AND detection in meat; (3) dry cured meat product and (4) cooked meat product. All candidates were able to distinguish between AND, SKA and AND + SKA in Vaseline oil, order AND solutions with different concentrations and classify them in the three categories: low, medium and high. The panel was able to differentiate the meat in the three categories, but only the high level in meat products. Due to the individual features in AND perception, specific training for each type of product is required.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Boar taint is an unpleasant odor mainly associated with the presence of two compounds: skatole (SKA) and androstenone (AND). Skatole (3-methylindole) is a metabolite derived from the amino acid tryptophan produced in the lower gut by intestinal bacterial flora, and AND (5 α -androsterone-16-en-3-one) is a steroid produced in the testis (Lunde, Skuterud, Egeland, et al., 2010). SKA is perceived by 99% of consumers and is regarded as unpleasant (Weiler, Fischer, Kemmer, Dobrowolski, & Claus, 1997), while the ability to perceive AND varies among subjects, since AND sensitivity is related with the genetic expression of the human odor receptor OR7D4 (Keller, Zhuang, Chi, Vosshall, & Matsunami, 2007). High levels of SKA in pig meat can be effectively reduced by diet and keeping animals free of faecal contamination (Whittington et al., 2011), while AND can be avoided by castration. In most EU countries male pigs are castrated to avoid boar taint in pork (Borrissier-Pairó et al., 2016). However, there is an increasing pressure to seek more humane alternatives to surgical castration, including marketing meat from entire animals with higher levels of AND (Bekaert, Hoerova, & Duca, 2013).

Sensory analysis is one of the most common tools used in meat (Egea et al., 2014; Whittington et al., 2011) and meat products

(Bañón, Costa, Gil, & Garrido, 2003; Lunde, Skuterud, Nilsen, & Egeland, 2009) studies. If a trained panel is not able to recognize off-flavors or differences between products, it is assumed that consumers will not perceive them either (Hoehl, Schoenberger, Schwarz, & Busch-Stockfisch, 2013). The detection thresholds and perceived odor quality of AND greatly vary among individuals. Meier-Dinkel et al. (2013) studied how olfactory acuity affects trained assessors' perception of boar taint compounds and found substantial variance among individuals: to highly sensitive panelist could detect at least a ten-fold lower amount of AND (15 ng) on smell strips than less sensitive subjects (150 ng). Annor-Frempong, Nute, Whittington, and Wood (1997) reported that, in a ten member panel, the individual detection thresholds for AND varied from 0.2 to 1.0 $\mu\text{g g}^{-1}$, adding that the selection and training of sensory assessors was essential (Meier-Dinkel et al., 2013). Variability in test results can be reduced by selecting the most sensitive candidates, and then training and checking their performance continuously (Romero Del Castillo, Valero, Casanas, & Costell, 2008), for which purpose a key issue is the development of a well designed protocol. In addition, although the perception of AND is limited by its genetic nature, individual threshold differences between persons can be reduced, since previous research has demonstrated that repeated olfactory testing can increase the ability to correctly discriminate AND (Mörlein, Grave, Sharifi, Bücking, & Wicke, 2012).

Although some studies have proposed training methods, most of them use various descriptors for AND and SKA (Bañón et al., 2003;

* Corresponding author.

E-mail address: mgarrido@um.es (M.^aD. Garrido).

Font-I-Furnols, Guerrero, Serra, Rius, & Oliver, 2000). However, differentiation between the components is more difficult when several attributes are used for the description of boar taint compounds (Dijksterhuis et al., 2000). Indeed, Lunde, Skuterud, Egeland, et al. (2010) demonstrated that it is better to use a low number of attributes for boar taint studies.

Furthermore, studies have demonstrated how the carrier influences odor and flavor perception in food products: for example, the studies of Baker and Ross (2014) in red wine, Cherdchu and Chambers (2014) in soy sauce and Lunde et al. (2009) in AND. Differences in boar taint perception between smell strips and fat were found in previous studies (Trautmann, Gertheiss, Wicke, & Mörlein, 2014). Pérez-Juan, Flores, and Toldrá (2008) found that volatile compounds of pork are influenced by binding with muscle proteins and other factors such as salt content and pH. Due to problems with tainted meat in the market place, there is a need to update on knowledge concerning processing opportunities for this raw material (Lunde et al., 2008) and the influence that the meat matrix has on AND perception. Therefore, it might be interesting to train a panel to detect boar taint in different meats and meat products. This paper suggests a protocol for training panels in AND perception for meat and meat products (dry cured and cooked) using a minimum number of descriptors (AND odor, AND flavor).

2. Materials and methods

The present study consisted of four main parts (Tables 1 and 2): (Part 1) selection and training of a panel with standards using Vaseline oil media as carriers of AND and SKA; developing a method for training AND detection in (Part 2) meat, (Part 3) dry cured meat products (chorizo sausage) and (Part 4) cooked meat products (frankfurter sausage). All tests were performed in a room equipped with individual tasting booths according to ISO 8589 (2007). There were two sessions per day, one at 10:00 h and second at 15:00. All tests followed the ethical rules and regulations set by the University of Murcia, Spain.

2.1. Selection of sensory panelists

Twenty four people, six men and eighteen women (24–55 years), all trained in tasting meat and meat products were tested for their ability to

detect AND and SKA crystals in pure form (Bañón et al., 2003). Anosmic candidates were rejected.

2.2. Part 1: Training to detect AND in Vaseline oil standard samples

2.2.1. Standard samples preparation for training

For the preparation of standard solutions (Bañón et al., 2003), AND (5α -androst-16-en-3-one, M 272.43 g mol⁻¹, Sigma-Aldrich A8008, Saint Louis, USA) and SKA (3-methylindole, M 131.17 g mol⁻¹, Sigma-Aldrich M51458, Saint Louis, USA) were diluted in Vaseline oil (Panreac, Castellar del Vallès, Spain) to obtain 5 mg kg⁻¹ solution, from which working solutions were made. For the different tests, 37 ml of each solution were introduced into amber glass bottles containing 2.5 g of cotton (Scharlau, Sentmenat, Spain). Prior to the training session the bottles were maintained at 35 °C (Bañón et al., 2003) in an oven for 24 h. Samples were coded with random three-digit numbers. Previously, all the bottles were washed with 3 ml of a solution of 4% TWEEN 80 in water and then rinsed 10 times with water, 3 times with deionised water and once with ethyl alcohol (70%). To conclude the cleaning of the bottles, these were heated for 24 h in an oven at 100 °C.

2.2.2. AND and SKA odor description

In the first session, odor descriptors and their relationship with AND and SKA were studied using two solutions of AND and SKA in Vaseline oil (Table 1). The AND concentrations used were based on the mean value of the higher levels obtained for entire male pigs in Spanish slaughterhouses (Borriesser-Pairó et al., 2016). The SKA concentrations obtained in the same study were below 0.1 mg kg⁻¹. However, since the SKA perception threshold is 0.1 mg kg⁻¹ (Bañón et al., 2003), it was decided to use a higher dose, 0.5 mg kg⁻¹, in the initial tests (“AND and SKA odor description” and “Identification of the boar taint compounds” tests) due to the difficulties involved in the differentiation of both products. The panelists were asked to describe the samples using all the terms they needed, unprompted and descriptive (Guerrero, Gou, & Arnau, 1997).

2.2.3. Identification of the boar taint compounds

The capacity of candidates deemed sensitive to AND, SKA and AND + SKA was evaluated following the indications of Jellinek (1985) and Galán-Soldevilla and Ruiz Pérez-Cacho (2012). For this purpose

Table 1
Different tests used to develop a method to train panelists to detect AND in vaseline oil.

Part	Scope of the experiment	Purpose	Method	Amount of odorant	Number of sessions
Pure crystals	Selection of analytical panelists, 24 potential panelists	Determination of AND and SKA sensitivity	Sniff AND and SKA pure crystals ^a	Pure crystals of AND and SKA	1
1 Vaseline oil	Training of panelist in AND and SKA detection in vaseline oil	AND and SKA description	Free generation ^b	1.5 mg kg ⁻¹ AND 0.5 mg kg ⁻¹ SKA	1
		Identification of the boar taint compounds	Ability to identify androstenone, SKA and AND and SKA in vaseline oil ^c	1.5 mg kg ⁻¹ AND 0.5 mg kg ⁻¹ SKA 1.5 mg kg ⁻¹ AND + 0.5 mg kg ⁻¹ SKA	4
		Ranking test	Order different solutions ^c	0.2, 0.7, 1, 1.8 (set 1) mg kg ⁻¹ AND 0.4, 0.7, 0.9, 1.2 (set 2) mg kg ⁻¹ AND 0.8, 1.2, 1.6, 2.0 (set 3) mg kg ⁻¹ AND	4
		Classification test	Three categories were fixed depending on the AND concentration: low (0–0.3 mg kg ⁻¹), medium (0.4–0.9 mg kg ⁻¹) and high (1–1.8 mg kg ⁻¹) ^d	0.2, 0.7, 0.8, 1.6, 2.0 mg kg ⁻¹ AND (set 1) 0.2, 0.4, 0.7, 1.5, 1.8 mg kg ⁻¹ AND (set 2) 0.2, 0.7, 0.9, 1.6, 2 mg kg ⁻¹ AND + 0.1 mg kg ⁻¹ SKA (set 3) 0.2, 0.4, 0.7, 1.2, 1.8 mg kg ⁻¹ AND + 0.1 mg kg ⁻¹ SKA (set 4)	8

AND: androstenone; SKA: skatole.

^a Bañón et al. (2003).

^b Guerrero et al. (1997).

^c Jellinek (1985), Galán-Soldevilla & Ruiz Pérez-Cacho (2012).

^d Font-I-Furnols et al. (2003), ISO 6658 (2005).

Download English Version:

<https://daneshyari.com/en/article/5791014>

Download Persian Version:

<https://daneshyari.com/article/5791014>

[Daneshyari.com](https://daneshyari.com)