

CONSUMER RESPONSES OF PIG MEAT DEPENDING ON THE SENSITIVITY TO ANDROSTENONE.

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INTRODUCTION

It is well known that boars may be superior to castrates, both from the economic and environmental point of view. Additionally castration is discussed controversial concerning animal welfare aspects. The disadvantage of boars is the boar taint problem, as meat from boars is not accepted by consumers due to a sex specific off odour.

All these factors influence the particular pig production system in each country or region. Germany and Spain differ in their pork production strategies. Whereas in Germany only gilts and castrated males are used for pork production, in Spain pork from entire males is regularly produced. However there is a split market for fresh pork in Spain, so that consumers can avoid meat from boars. Boar taint has been mostly related to the levels of two compounds, skatole and androstenone (Hansson *et al.*, 1980). The relative contribution of the two substances is still discussed controversial (Bonneau, 1992). In a unique large Spanish consumer trial, comparing the consumer reactions to fresh chops from boars and castrates, a higher proportion of negative responses was observed for odour and flavour of boar chops with high androstenone concentrations; than for pork from castrates or boars with medium or low androstenone levels (Diestre *et al.*, 1990), whereas some studies in other European countries pointed a lower impact of androstenone for consumer reactions. The inhomogenous results are partly explained by the phenomenon, that human perception of androstenone, varies extremely between individuals from extremely sensitive to a androstenone specific anosmia. A similar variability in the perception of skatole does not exist (Weiler *et al.*, 1997). Therefore, the acceptability of the boar meat may vary according to the androstenone sensitivity of consumers. So far, no systematically studies about consumer reaction to boar meat including the aspect of consumer sensitivity have been published. Thus it was the aim of our study to evaluate consumer responses to odour of pork meat, depending on the sensitivity of the consumers (German and Spanish) and the androstenone content of the meat samples.

MATERIAL AND METHODS

A total of 472 German and 480 Spanish consumers from 6 (Germany) and 3 (Spain) different places respectively were included. The carcasses had been selected according to their levels of androstenone, measured with an enzyme immuno-assay and skatole, measured colourimetrically (Bonneau *et al.*, 1998).

For the consumer test, joints from each carcass were roasted in an oven at 180°C to an internal temperature of 75°C. Thereafter, they were cut in slices of 15 mm with 5 mm overlying subcutaneous fat. The slices were trimmed and each slice cut into 4 pieces. Each piece was placed in sealed aluminum foil containers, covered with aluminum foil and chilled at 4°C during 1-3 days. On the day of the consumer test, they were heated again for 10 minutes in an oven at 180°C to achieve an internal meat temperature of 80°C. Immediately before presentation, the samples were heated on a hot plate at 250°C during 1 minute in order to achieve 95°C of internal temperature. Thus each sample had been heated three times before it was presented to the consumer. Each consumer tested 5 samples and ranked the pleasantness of odour on a seven step hedonic scale (1: like very much; 7: dislike very much). After this test the sensitivity of the consumers to androstenone was tested presenting a vial with some crystals of standard. The consumers were asked to give their impression on a seven step scale (1: very weak; 7: very strong). The sensitivity to perceive androstenone was defined following two different classification criteria: (1) Sensitives including smell scores from 5: strong to 7: very strong. (2) Sensitives include smell scores from 4: neither weak or strong to 7: very strong.

RESULTS AND DISCUSSION

Table 1 shows the percentages of sensitive consumers to androstenone using the two different classification criteria depending on the sex of the consumers and the places of assessment both in Germany and Spain. The percentages of highly sensitive consumers varies according to places of assessment. In Germany the percentage of sensitives ranged between 13.2 vs 26.3 in case of classification criteria 1 or 25.0 vs 43.8 % (using classification criteria 2). In Spain for classification 1, the percentage varied between 26.9 to 34.9 and between 45.4 to 48.1 using classification 2. According to both classifications, women were significantly more sensitive than men in the two countries (all: $p < 0.05$). Similar differences in the ability to perceive androstenone were found in other studies (Gilbert & Wysocki, 1987) and they provide an explanation for regional differences of consumer reactions.

The sensitivity influenced the rating of the pork samples significantly. Figure 1 shows the least squares means of odour scores depending on the sensitivity of the German and Spanish consumers and the androstenone concentrations of the samples. For medium and high androstenone content there were large differences in the evaluation of the samples between sensitive or insensitive consumers. The results of this study suggested that the sensitive Spanish and German consumers distinguished significantly the odour of meat samples with different androstenone concentrations, even if the repeated heating of the test samples before the presentation is known to cause a high but variable loss of androstenone. The insensitive consumers could not distinguish among samples with different androstenone levels.

In conclusion, consumer sensitivity to androstenone affects the acceptability of the boar meat and should be taken into account in the pig meat market, especially as the frequency of boar carcasses with medium and high androstenone concentrations is above 60% (Bonneau *et al.*, 1998).



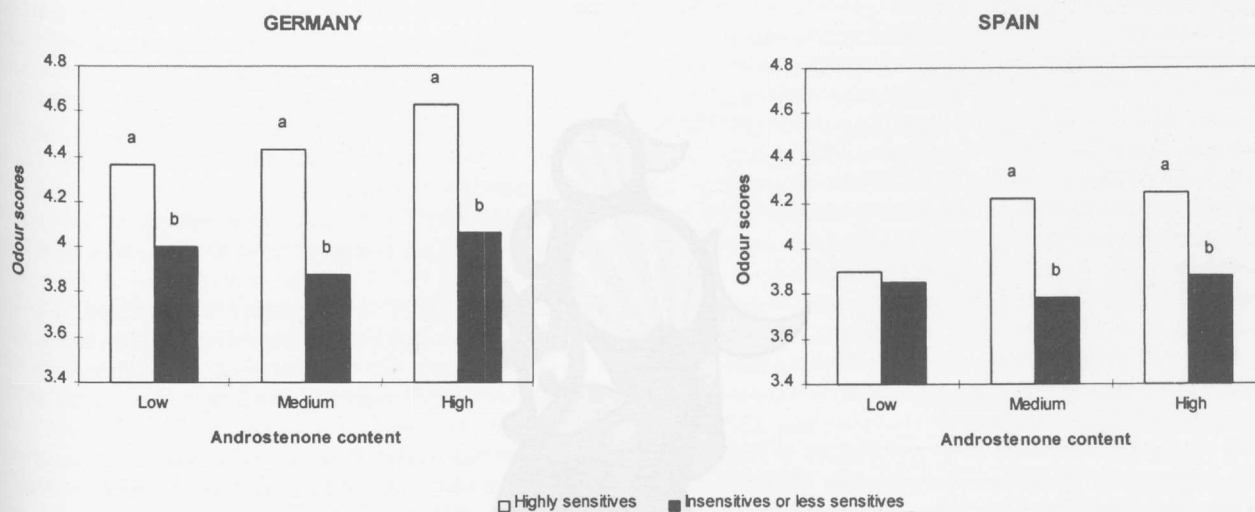
Table 1: Percentages of androstenona sensitivity consumers using two different classification criteria depending on the sex of the consumers and the place of assessment in Germany and Spain.

Country of assessment	Classification 1		Classification 2	
	Highly sensitives (5-7)	Less sensitives or insensitives (1-4)	Sensitives (4-7)	Less sensitives or insensitives (1-3)
GERMANY				
Sex				
men	15.64	84.36	30.33	69.67
women	19.28	80.72	34.14	65.86
total	17.61	82.39	32.39	67.61
Place of assessment				
1	13.33	86.67	29.33	70.67
2	20.51	79.49	33.33	66.67
3	15.38	84.62	32.69	67.31
4	26.25	73.75	43.75	56.25
5	16.00	84.00	25.00	75.00
6	13.16	86.84	31.58	68.42
SPAIN				
Sex				
men	23.71	76.29	40.33	59.67
women	37.35	62.65	51.90	48.10
total	30.80	69.20	46.34	53.66
Place of assessment				
La Bisbal d'Empordà	31.63	68.38	45.38	54.63
Zaragoza	34.18	65.82	48.10	51.90
Madrid	26.88	73.13	45.63	54.38

Classification 1: sensitives: including smell scores 5=strong to 7=very strong.

Classification 2: sensitives: including smell scores 4=neither wear of strong to 7=very strong

Figura 1: Least squares means of odour scores depending on the sensitivity of the German and Spanish consumers and the androstenone content of the samples (Low: <math><0.5 \mu\text{g/g}</math>; medium: 0.51 to 1.0 $\mu\text{g/g}</math>; high: >1.0 $\mu\text{g/g}</math>).$$



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NOTES

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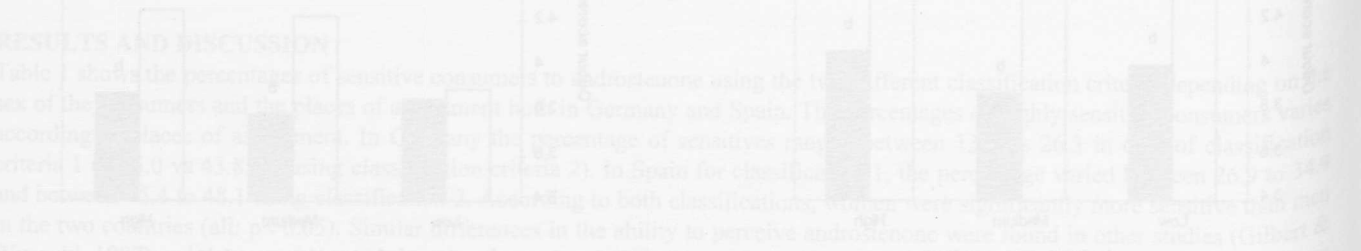
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INTRODUCTION

It is well known that boars may be superior to sows, but from the economic and environmental point of view, castration is becoming an increasingly important aspect. The disavowal of boars is the best way to avoid the problems associated with boar taint, which is caused by a sex-specific odour. All these factors influence the particular pig production system in each country or region, Germany and Spain are no exception. Whereas in Germany only gilts and castrated males are used for pork production, in Spain both sexes are used. However, there is a high market for boar taint-free pork in Spain, and producers can avoid taint from boars. Boar taint is mostly related to the levels of two substances, androstenone (Diezire et al., 1990). The relative contribution of the two substances to the boar taint depends on the consumer's sensitivity to androstenone. Consumer reactions to boar taint change from boar taint-free to boar taint-free, and then to boar taint-free, depending on the androstenone levels (Diezire et al., 1990), whereas some studies in other European countries pointed a lower impact of androstenone on consumer reactions. The interogeneity results are partly explained by the phenomenon, that human perception of androstenone varies extensively between individuals, extremely sensitive to androstenone (Weller et al., 1997). The sensitivity to androstenone does not seem to be related to the sensitivity to androstenone, but no systematic study of the sensitivity of consumers to boar taint has been published. Thus it was the aim of this study to investigate the sensitivity of consumers to boar taint depending on the sensitivity to androstenone.

MATERIALS AND METHODS

A total of 100 consumers (50 males and 50 females) were recruited from a newspaper advertisement. The consumers were divided into two groups according to their sensitivity to androstenone, classified as 'sensitive' (50) and 'not sensitive' (50). The consumers were asked to taste and evaluate a piece of pork meat (15 mm thick) which was prepared in a hot plate at 150°C for 10 min. The consumers were asked to evaluate the meat on a 7-point scale (1: like very much, 7: dislike very much) for the following two different classifications criteria: (1) 'like very much' to 'dislike very much' and (2) 'strong' to 'weak or no odour'. The consumers were asked to evaluate the meat on a 7-point scale (1: like very much, 7: dislike very much) for the following two different classifications criteria: (1) 'strong' to 'weak or no odour' and (2) 'strong' to 'weak or no odour'. The consumers were asked to evaluate the meat on a 7-point scale (1: like very much, 7: dislike very much) for the following two different classifications criteria: (1) 'strong' to 'weak or no odour' and (2) 'strong' to 'weak or no odour'.



RESULTS AND DISCUSSION
Table 1 shows the sensitivity to androstenone of consumers in Germany and Spain according to the sex of the consumer. In Germany, the sensitivity to androstenone was significantly higher (p < 0.05) in males than in females. In Spain, the sensitivity to androstenone was not significantly different between males and females. The sensitivity to androstenone of consumers in Germany was significantly higher (p < 0.05) than in Spain. The sensitivity to androstenone of consumers in Germany was significantly higher (p < 0.05) than in Spain.

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