BACKFAT ODOUR ASSESSMENT FROM IMMUNOCASTRATED PIGS

Cipolli; K. M. V. A. B. [1]*; Guadagnini, R. A. [2]; Orlando, E.[3]; Felício, P.E.[4]; Silveira, E.T.F[3]

[1] Sensory, Physics and Statistic Analysis Reference Laboratory Unit, Food Science and Quality Centre, Institute of Food technology, Av. Brasil, 2880, 17070-178, Campinas, SP, Brazil.
[2] Graduate Student in Chemistry, IQ-University of Campinas, and Fellow of CNPq - Institute of Food technology, Av. Brasil, 2880, 17070-178, Campinas, SP, Brazil.
[3]Meat Technology Centre, Institute of Food Technology, Av. Brasil, 2880, 17070-178, Campinas, SP, Brazil.
[4]Department of Food Engineer, University of Campinas, 80 Cid. Univ. Zeferino Vaz, Campinas, SP, Brazil.
*Corresponding author (phone: +55-19-3743-1811; fax: +55-19-3743-1812; e-mail: kcipolli@ital.sp.gov.br).

Abstract- **One hundred and twenty crossbred pigs (Tempo, sire and Topigs 40, dams) and PIC crossbred pigs (G337 sire and CB22 dams) from two commercial farms with a total of 12 treatments (n = 10) in a completely randomized design factorial 3 (female, FE, physically castrated male, PC, and immunocastrated, IC) x 2 (7.5 mg/kg ractopamine during 21 days) aiming to clarify the interaction of these two technologies on the fat odour evaluation. Descriptive analysis of odours (androstenone, skatole, characteristic swine odour, 10cm scale) with 10 judges previously trained (10h) was carried out. The judges are members of descriptive analysis panels of foods involving coffee/yogurt/meat products and fragrances, 2 years experience, daily evaluations. The skatole in some samples was evaluated by CG, with SPME. Results showed significant effects ($p<0.05$) for skatole odours while androstenone and characteristic fat swine odour showed no significant effects ($p>0.05$) as perceived by a trained panel. Instrumental skatole showed level varying from 0.0053 to 0.0408 mg/kg ($p>0.05$). In conclusion the low intensity of androstenone and skatole odours did not harm the characteristic odour of pig backfat.**

Keywords — Pig, Sensory, Immunocastration, Ractopamine hydrochloride, Androstenone, Skatole.

I. INTRODUCTION

The complex industrial pork chain and the scientific community working tirelessly to improve efficiency in meat production, animal health, nutrition, and facility management strategies to attend the growing demands of the consumer market. The challenge for this new model is to combine meat quality and quantity from pork appropriately, in order to ensure the economic feasibility of the meat industry. Immunocastration, technology relatively new in Brazil, is an alternative to the surgical castration, it is a technology that has been developed to reduce boar taint compounds in pork by a temporary suppression of testicular function through vaccination against gonadotrophin releasing factor (GnRF) [1].

Regarding the aspect of nutrition, Ractopamine acts by altering the animal metabolism and modifying the distribution of nutrients with positive results of these technologies on feed efficiency and quantity of lean meat [1, 2, 3]. The industry requires further studies to clarify the interaction of these two technologies on processed swine meat quality traits. The objective of this study was to assess the fat quality from different treatments groups, focusing on the backfat odour from female, FE, physically castrated male, PC, and immunocastrated, IC, associated or not with, 7.5 mg/kg ractopamine during 21 days and entire boar EB.

II. MATERIALS AND METHODS

A. Animals.

One hundred twenty crossbred pigs (Tempo, sire and Topigs 40, dams) (A) and PIC crossbred pigs (G337 sire and CB22 dams) (B) from two commercial farms were grouped in females (FE), physically castrated (PC) and immunocastrated boars (IC), fed or not with ractopamine hydrochloride (7.5 mg/kg, Ractosuin, Ourofino Agrobusiness) for the final 21 days before slaughter. The boars designated to be immunocastrated received two doses of vaccine according to recommendation (Improvac®, Pfizer Animal Health). The experiment was carried out as a factorial (2 x 3) arrangement with RAC diet (0 and 7.5 mg/kg) and sex categories (FE, PC and IC). Frozen backfat of 5 entire boar, IB, (PIC crossbred pig with RAC diet) was used in this experiment as well. The slaughter procedure followed the current Brazilian practices.

B. Samples.

After slaughter carcasses were chilled during 22 to 24 hours, sent to the Meat technology Center pilot plant, deboned and 120 backfat samples were taken, vacuum packed, stored at ultra freezer (-87ºC) and thawed for sensory and chemical evaluations. Backfat sample (10 g) and 10 mL mineral water were introduced in vials, capped, heated in water bath (50ºC) and covered with aluminum foil so that no significant change occurred by the action of light (rancid odour), and also the judges were not influenced by appearance during the odour evaluation.

C. Sensory and chemical evaluation.

A descriptive analysis of odours (androstenone, skatole, characteristic swine odour) using an unstructured scale of 9 points (10 cm), with 10 judges previously trained (10 h) was carried out. The judges used in this study are team members of descriptive panel food analysis, coffee/yogurt/meat products and fragrances, at least for 2 years experience, with daily evaluations, presenting good reproducibility, repeatability and good discrimination among many odours in food and fragrances. The panelists were trained based on quantitative descriptive analysis test for the attributes of interest for the project [5, 6, 7]. Thus, they identified androstenone in mineral oil and in mineral water and in triangular tests (water - water with crystals; oil – androstenone 0.50 µg / g). Judges identified, defined and quantified the perceived odour intensity of androstenone and skatole using scales anchored at some references points which were presented in Table 1. The descriptive analysis was carried out in the Sensory, Physics and Statistic Analysis Reference Laboratory Unit (LAFISE) of CCQA/ITAL. The evaluations were performed in laboratory equipped according to ISO [8] in monadic way, in individual cabins and electronic registration of sensory data (CSA, Compusense Five, Version 4.8, Canada). Backfat of animal were analyzed considering: 3 farms (A, B, C), 4 genders (FM, CC, IM, IT) and 2 levels of RA.

Factor treatment (FE, FERAC, PC, PCRAC, IM, IMRAC, ITRAC) was analyzed too. A hundred and eighteen samples were presented blind to consumers in a monadic way. Data was submitted to GLM (General Linear Models) and Tukey test to compare means with the 95% confidence interval, using SAS, v.8.7.

The skatole in some samples was extracted through SPME fibers (Supelco Inc., USA) and evaluated by chromatographic analysis (Agilent model 5890 with FID detector); using 2-methyl indole as internal standard – methodology will be published soon.

Table 1 – References of sensory assessment

Androstenonne	0.50 µg/g - body odour that causes slight burn in the nostrils and reminds urine/ sweat odour - score 2 in linear scale.
Skatole	0.40 µg/g - Remembering very intense odour of feces, manure - score 9 in the linear scale.
Characteristic fat swine odour	characteristic odour of barrows/castrated swine backfat kept in warm water – score 7 in the linear scale.

III RESULTS AND DISCUSSION

Regarding that all the 10 judges were able to detect androstenone in all the tests applied, 8 of them were selected (3 men and 5 women; 1 (woman) presented high perception of androstenone). Using crystals, an author [9] worked on detection of androstenone, and reclassified already trained judges in Europe: 74% of them were able to detect differences in meat samples with 3.0 ppm of androstenone, and reported the difficulty of judges get sensitive to that substance, though they were trained. The statistical results showed significant differences ($p<0.05$) among judges and sometime interactions ($p>0.05$) between them and the farm, gender, RAC diet. Regarding their knowledge of differences it was hard to distinguish androstenone or skatole in several samples. This fact is in accordance to [10] who reported the difficult to differentiate the boars attributes skatole and androstenone.

Considering the farm, the statistical results showed differences (Table 2, $p<0.05$) for genders (Figure 1), RAC diet (Figure 2), treatments (Figure 3) and judges. The odour statiscal results showed difference ($p<0.05$) between farms A and B and A and C; between genders EB and FE as well as EB and PC, between IC and FE (farm A); between treatments FERAC and ICRAC (farm A), for androstenone. Means of androstenone scores were considered low (close to score 2). According to [11] there is a discrepancy between the values of the sensory threshold for androstenone, but the highest concentration used was in the range of 0.5 and 1.0 µg/g.

The present study showed that a time period of 8 and 4 weeks for vaccination and slaughter were not detrimental for the immunization effect and corroborate with [12] who studied immunocastred and surgical castrated androstenone odour in salivary glands and concentration in backfat.

Results showed no difference ($p>0.05$) for skatole when farms were analyzed; showed difference ($p<0.05$) between genders IC and PC (farm B), and between treatments IMRA and CC.

Results of characteristic fat odour showed difference ($p<0.05$) between farms A and B and between A and C; between genders EB and PC and between treatments IC and PC (farm A). Means of characteristic odour of farms was normal (close to score 7) and B was different from A - probably due to the major weight of animals in B (not showed in this work).

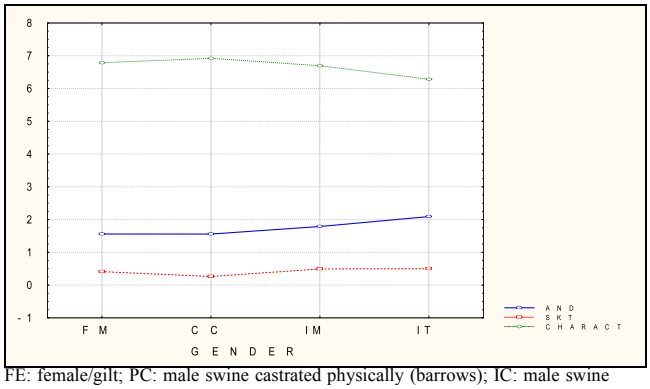
Table 2 – Odour sensory assessment for farm

Farm (animals)	Odour Perception (means ± standard deviation)		
	Androstenone	Skatole	Characteristic
A (54)	1.4^{b} ± 1.4	0.4 ± 0.8	6.9^{a} ± 1.7
B (59)	1.9^{a} ± 1.8	0.4 ± 0.8	6.7^{b} ± 1.6
C (5)	2.1^{a} ± 2.0	0.4 ± 0.8	6.3^{b} ± 1.9

A,B,C: farms / slaughterhouse where the animals were obtained.

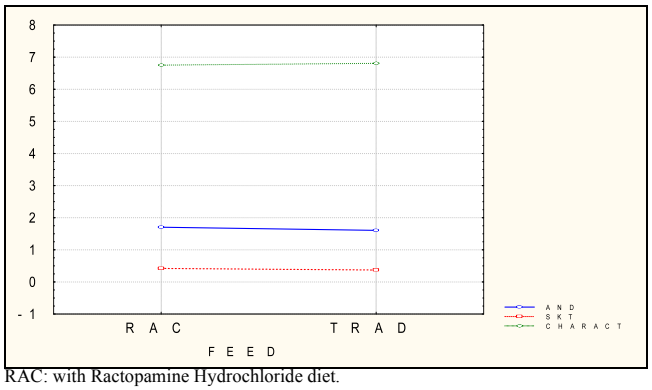
Means with different superscripts in same columns are significantly different ($p < 0.05$).

Overall results for immunocastration and castration showed significant effects ($p<0.05$) for skatole odours while androstenone and characteristic fat swine odour showed no significant effects ($p>0.05$) as perceived by a trained panel.



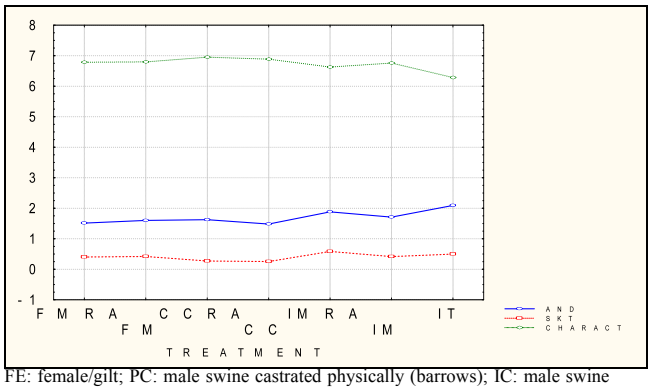
FE: female/gilt; PC: male swine castrated physically (barrows); IC: male swine castrated immunologically; EB: entire/non-castrated young male.

Figure 1. Odour Perception among genders



RAC: with Ractopamine Hydrochloride diet.

Figure 2. Odour perception with Ractopamine Hydrochloride diet



FE: female/gilt; PC: male swine castrated physically (barrows); IC: male swine castrated immunologically; EB: entire/non-castrated young male; RAC: with Ractopamine Hydrochloride diet.

Figure 3. Odour Perception among treatments

Instrumental analysis of skatole showed 0.0053 (over limit quantification below) for IC to 0,078 for FERAC. The results presented in Table 3 showed no difference ($p>0.05$) for intensity of skatole and was in according to sensory assessment.

Table 3 – Skatole Concentration

SAMPLE	*SKATOLE * (µg/g)*
Physical Castrated (PC)	0.0619 ± 0.0056
PC with Ractopamine (RAC)	0.0487 ± 0.0125
Female with RAC	0.0778 ± 0.0312
Imunocastrated	0.0053** ± 0.0054
IMRAC	0.0783 ± 0.0587
Entire Boar	0.0744 ± 0.0134

*means±standard deviation; **over limit quantification below – 0.037558 µg/g.

IV CONCLUSION

The low sensory intensities of androstenone and skatole as well as the instrumental skatole results did not harm the characteristic odour of pig backfat. Thus, immunocastration and Ractopamine feeding as used in these 2 farms can be successfully applied .

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