RACTOPAMINE HYDROCHLORIDE AND IMMUNOCASTRATION EFFECTS ON THE FATTY ACID COMPOSITION ON BELLY QUALITY

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Abstract – **Forty-eight bellies from two commercial farms crossbred pigs (Tempo, sire and Topigs 40, dams) and PIC crossbred pigs (G337 sire and CB22 dams) with a total of 12 treatments (n = 4) 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 fatty acid composition on belly quality. The total saturated fatty acids (SFA) increased (P<0.05) with the addition of 7.5 mg/kg ractopamine of the diet from gilts and barrows, but the bellies from immunocastrated decreased concentrations of SFA. The bellies from PIC crossbred pigs had lipids with higher proportions of polyunsaturated fatty acids (PUFA) and linoleic acid (C 18:2 n-6; P<0.05). The highest concentration of monounsaturated fatty acids (MUFA; P<0.05) was found in the fat of females with ractopamine from PIC crossbred, whereas the lowest concentration was found in the fat of immunocastrated from crossbred pigs. The results of this study would suggest that the commercial farm PIC crossbred pigs resulted a softer and more flexible belly having a lower proportion of saturated fat relative to polyunsaturates. In conclusion the present study suggests an interaction effect between ractopamine and immunocastration technologies on the belly fatty acid composition from both farms, showing a lipid which contains the highest and lowest concentration of unsaturated fatty acids and saturated fatty acids, respectively.**

Keywords – **pork belly, ractopamine hydroclorated, immunocastrated, fatty acid composition**

I. INTRODUCTION

Typically pork fat contains high concentrations of saturated fatty acids and lower concentrations of poly-unsaturates [9]. Oleic acid (C18:1) is the major component of pig adipose tissue lipids, usually exceeding 40 % of the total, but its concentration is poorly related to the firmness of the tissue [3]. Selection for reduced backfat thickness has resulted in an increase in the concentration of linoleic acid [18,12]. The fatty acid profile of pork fat can influence processing properties [16,13], while the consumption of saturated fatty acids by humans may increase LDL-cholesterol, resulting in an increased risk of coronary heart disease. Research in swine nutrition has shown that the fatty acid profile of pork fat can be altered by feeding diets [9,7,4].

The ractopamine (RAC) has been demonstrated to increase nitrogen retention, improve growth performance, and increase carcass leanness when fed to finishing pigs [1,17]. It is widely used throughout the swine industry decreased fatty acid synthesis in porcine adipose tissue [9,8], which could alter the fatty acid composition of the adipose tissue, and has been shown to improve growth rate and the efficiency of growth, carcass composition, and carcass cutting yields without detrimental effects on belly [15]. Some authors [1] reported that ractopamine-treated pigs showed a smaller percentage improvement in growth performance as duration of ractopamine treatment increased. However, changes in the fatty acid composition of carcass tissues from pigs fed ractopamine have not been reported. Due to consumer preferences for leaner meat products, the goal of swine production has been to reduce fat and increase lean in animals to improve acceptance and profitability [15].

The current study was designed to determine the combined effects of these two technologies associated with two commercial crossbred pigs on the belly fatty acid composition.

II. MATERIALS AND METHODS

Forty-eight bellies from two commercial farms crossbred pigs (Tempo, sire and Topigs 40, dams) and PIC crossbred pigs (G337 sire and CB22 dams) with a total of 12 treatments (n=4), from two commercial farms were randomly selected in females (FE), physically castrated (PC) and immunocastrated male pigs (IC), fed or not with RAC (7.5 mg/kg, Ractosuin®, Ourofino Agronegócio) 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). The slaughter procedure followed the current Brazilian practices.

A 50 g fat sample was removed from each treatment for fatty acid profile analysis. This sample was carefully removed from the muscle so that the three fat layers would be intact. Fat samples were taken and completely homogenized using a food processor for the experiment for fatty acid profile determination.

Fatty acid composition was measured after methylation of the samples. Fatty acid methyl esters were prepared for subsequent use in gas-liquid chromatography according to procedures developed by [5]. Trimmed fat samples of green belly were analyzed on a gas chromatograph equipped with a fused-silica capillary column (100m × 0.25 mm internal diameter) with a base-deactivated silica stationary phase (a 0.20-µm film thickness). The furnace temperature was 120 °C, and injector and detector temperatures were 235 °C. Identification of fatty acid methyl esters was accomplished by comparing retention times of peaks of known origin.

Statistical analysis. The statistical significance of the difference between the fatty acids profile in belly was determinated by ANOVA. Significance of the difference between means was determined by Tukey test. The principal variables were treatments and sex. All data were analyzed using the General Linear Model procedure of SAS. The tests of the multiple comparision were performed by Tukey ($P < 0.05$).

III. RESULTS AND DISCUSSION

The fatty acid profile results are showed in Table 1 and 2. The total saturated fatty acids (SFA) increased ($P<0.05$) with the addition of 7.5 mg/kg ractopamine of the diet from gilts and barrows, but the bellies from immunocastrated decreased concentrations of SFA (Table 1). The bellies from PIC crossbred pigs (Table 2) had lipids with higher proportions of polyunsaturated fatty acids (PUFA) and linoleic acid (C18:2 n-6; $P<0.05$). The highest concentration of monounsaturated fatty acids (MUFA; $P<0.05$) was found in the fat of females with ractopamine from PIC crossbred (Table 2), whereas the lowest concentration was found in the fat of immunocastrated from crossbred pigs.

Table 1. Effect of the processing on the profile of fatty acids of belly of farms crossbred pigs (Tempo, sire and Topigs 40, dams)

Tratament	C18:2n-6	SFA	MUFA	PUFA	ω6
Gilts with RAC	$12,93^{abc}$	$37,46^{abcd}$	$46,01^{ab}$	$13,83^{abc}$	$13,25^{abc}$
Gilts without RAC	$13,12^{abc}$	$37,44^{abcd}$	$45,79^{ab}$	$14,03^{abc}$	$13,43^{abc}$
Barrow with RAC	$12,53^{ac}$	$38,64^{cd}$	$44,86^{ab}$	$13,35^{ac}$	$12,77^{ac}$
Barrow without RAC	$11,19^{c}$	$37,72^{bcd}$	$46,94^{a}$	$11,96^{c}$	$11,44^{c}$
Immuno with RAC	$13,27^{abc}$	$36,53^{abcd}$	$46,15^{ab}$	$14,17^{abc}$	$13,56^{abc}$
Immuno without RAC	$13,46^{abcd}$	$39,10^{d}$	$43,48^{b}$	$14,40^{abcd}$	$13,77^{abcd}$

The results in the present study would suggest that the comercial farm PIC crossbred pigs were softer more flexible bellies having a lower proportion of saturated fat relative to polyunsaturates. The results of this study indicate that the fatty acid profile, shows interaction between the effect of ractopamine and immunocastrated on the belly quality.

Table 2. Effect of the processing on the profile of fatty acids of belly of PIC crossbred pigs (G337 sire and CB22 dams)

Tratament	C18:2n-6	SFA	MUFA	PUFA	ω6
Gilts with RAC	14,40^{abde}	36,60^{ab}	47,13^{a}	15,30^{abde}	14,64^{abde}
Gilts without RAC	15,43^{bde}	33,98^{a}	46,53^{ab}	16,39^{bde}	15,62^{bde}
Barrow with RAC	14,44^{abde}	37,67^{abcd}	44,16^{ab}	15,29^{abde}	14,65^{abde}
Barrow without RAC	14,81^{abde}	36,24^{abcd}	45,04^{ab}	15,73^{abde}	15,07^{abde}
Immuno with RAC	16,17^{de}	34,52^{ab}	45,16^{ab}	17,21^{de}	16,44^{de}
Immuno without RAC	16,22^{e}	35,19^{abc}	43,99^{ab}	17,26^{e}	16,47^{e}

The results of Tables 1 and 2 showed a small increase but not significantly (P>0.05) in the total amount of polyunsaturated fatty acids, to the ones that received ractopamine in the feed.

According to [14] the composition and the quality of the meat are influenced by the sex, due to differences of hormone.

The swine meat is considered one of the greatest sources of MUFA, a monounsaturated fatty acid that influences the reduction of the cholesterol levels, its loss is considered a public health problem. Other study [6] also found a reduction in the monounsaturated fatty acids content.

The difference of fatty acid in the belly becomes part of the variability often seen during packaging of sliced bacon. This is well within the range that impacts slicing efficiency found in commercial slicing operation of belly with great value of unsaturated fatty acids [10].

IV. CONCLUSIONS

In conclusion the present study suggests an interaction effect between ractopamine and immunocastration technologies on the belly fatty acid composition from both farms, showing a lipid which contains the highest and lowest concentration of unsaturated fatty acids and saturated fatty acids, respectively.

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