CARCASS TRAITS OF NELLORE CATTLE IMMUNOCASTRATED FED ON BETA-ADRENERGIC AGONISTS

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Abstract - The effect of using two beta-adrenergic agonists (βAA) in combination with the immunocastration technique was evaluated using 96 Nellore males in a randomized complete block (initial LW) design with two sexual conditions (imunocastrated - IC *vs* non-castrated - NC) and three treatments (control diet without βAA (CON); 80mg/d zilpaterol hydrochloride (ZIL); 300mg/d of ractopamine hydrochloride (RAC). The total feedlot period was 100 days and βAA was offered in the last 30 days before slaughter. Ultrasound measurements of Longissimus muscle area (LMA) and backfat thickness (BFT) and rump fat (RFT) were collected in the beginning and at the end of βAA feeding period. At slaughter, the kidney, pelvic and heart fats (KPH) were measured. The pH and carcass temperature were collected 1h after slaughter and after 24h of chilling. No sex condition vs treatment interaction was observed for any trait. The IC males showed higher weight (P=0.0484) and percentage of KPH fat (P<0.0001) and lower pH1 and pH24 (P<0.0001) when compared to NC. No sex condition effect was observed of ultrasound carcass traits. The ZIL showed smaller KPH weight and percentage and great LMA gain than CON and ZIL. There was no treatment effect for other traits.

I. INTRODUCTION

The beta-adrenergic agonists (βAA) are growth promoters analogs of cathecolamines which promote muscle hypertrophy and reduces carcass fat. Increase of Longissimus muscle area (LMA) and reduction of backfat thickness (BFT) of animals fed to βAA have been reported [1],[2],[3]. Avendaño-Reyes *et al.* [1] and Strydon *et al.* [4] found no difference in the temperature and pH of the carcass of animals fed βAA. Another practice that can be used to improve carcass and meat quality is the castration of animal. More recently, the immunocastration has been developed to in substitution of traditional castration methods. Roça *et al.* [5] reported that immunocastration increases the rate of intramuscular fat and carcass compared to non-castrated animals. Studies of the effects of immunocastration on carcass traits of Nellore cattle are scarce and information about the use of βAA on carcass traits of Zebu cattle, are still unknown. Therefore, it is relevant to study the effects of these products and a possible interaction between them to better understand how these products can be used to improve the profitability of production systems. Therefore, this study was developed to evaluate the effect of the βAA, Zilpaterol and Ractopamine, in combination with the immunocastration on carcass traits of feedlot finished Nellore cattle.

II. MATERIALS AND METHODS

Ninety-six males (409 ± 50 kg LW; 20 mo old) were divided in two groups and half of them received two doses of immunocastration vaccine (Bopriva® - Zoetis Veterinary Products Industry LTDA, São Paulo, SP, Brazil) within 30 days interval. Animals were fed for 70 days a common diet containing 76% concentrate and 24% roughage (corn silage). Following they were split in three groups (n=32) and fed 30 more days one of the following treatments: control diet without BAA (CON); diet containing 80mg/d zilpaterol hydrochloride

(ZIL; Zilmax® - MSD Animal Health, São Paulo, SP, Brazil); diet containing 300mg/d of ractopamine hydrochloride (RAC; Optaflexx® - Elanco Animal Health, São Paulo, SP, Brazil). Ultrasound measurements of *Longissimus* muscle area (LMA) and backfat thickness (BFT) between the 12th and 13th ribs and rump fat thickness (RFT) were collected in the beginning and at the end of βAA feeding period. The gain of each ultrasound trait calculated by final minus initial measurement. After this period, the animals were slaughtered according to humanitarian slaughter procedures as required by Brazilian laws. During the slaughter the fat kidney, pelvic and heart (KPH) were collected and weighed. Then, the pH and temperature of carcasses were measured after 1 and 24h of chilling, in the *Longissimus* muscle between the 12th and 13th ribs using a portable digital pH meter. Data was analyzed as complete block randomized design in a 2x3 factorial arrangement.

III. RESULTS AND DISCUSSION

No sex condition vs treatments interaction was observed for any trait. There was no sex effect on LMA and BFT gains during the βAA feeding period, as in the study of Ribeiro *et al.* [6], maybe for a higher gain during the βAA without feeding period, which was decreasing until the slaughter.

The IC showed greater RFT gain (P=0.0574; Table 1), higher weight (P=0.0484) and percentage of KPH fat (P<0.0001) when compared to NC. This can be due to the lower testosterone action on IC, then there was lower muscle deposition and higher carcass fat deposition, mainly viscera. The NC males showed higher initial (1h) and final (24h) pH (P<0.0001) when compared to IC, on the contrary of reported by Amatayakul-Chantler *et al.* [7] which found no difference on carcass pH. This higher pH observed for NC males can be related to the trend of higher stress susceptibility of non-castrated males on pre-slaughter.

Table 1- Means and standard errors (SE) of carcass traits of imunocastrated (IC) and non-castrated (NC) Nellore males.

	Sex condition		
Carcass traits	IC	NC	SE
Longissimus muscle area gain, cm²	7.3	7.3	1.02
Backfat thickness gain, mm	0.9	0.8	0.20
Rump fat thickness gain, mm	1.4[a]	0.6[a]	0.95
Kidney, pelvic and heart fat, kg	5.5[a]	5.1[b]	0.16
Kidney, pelvic and heart fat, % of carcass weight	3.7[a]	3.2[b]	0.09
pH 1 h	6.6[b]	6.9[a]	0.04
pH 24 h	5.5[b]	5.8[a]	0.04
Carcass temperature 1h, °C	32.7	32.5	0.54
Carcass temperature 24h, °C	2.0	1.8	0.18

[a,b] Different letters in the same row differ (P<0.05).

The LMA increase was greater in animals fed to ZIL than those fed RAC and CON (P<0.0001) with no differences between RAC and CON treatments (Table 2). This result partially agree with those found by Avendaño-Reyes *et al.* [1], who observed greater LMA for animals fed βAA when compared to a CON diet. On the other hand, the same authors did not found differences in LMA for ZIL and RAC treated animals.

On the contrary, ZIL fed animals showed smaller BFT, weight and percentage of KPH fat (P<0.05) than CON and RAC treatments, Quinn *et al.* [2] found no difference on BFT in the groups RAC vs CON, however, Beckett *et al.* [3] reported smaller BFT in the group ZIL vs CON.

There was no effect of treatments on RFT gain or carcass pH and temperature.

Table 2- Means and standard error (SE) of carcass traits according to the treatments.

	Treatments[1]			
Carcass traits	CON	RAC	ZIL	SE
Longissimus muscle area gain, cm²	4.3[b]	6.6[b]	11.0[a]	1.20
Backfat thickness gain, mm	1.2[a]	0.9[a]	0.4[b]	0.24
Rump fat thickness gain, mm	1.0	0.8	1.1	0.42
Kidney, pelvic and heart fat, kg	5.7[a]	5.4[a]	4.7[b]	0.19
Kidney, pelvic and heart fat, %	3.8[a]	3.5[a]	3.0[b]	0.11
pH1	6.7	6.8	6.7	0.05
pH24	5.6	5.7	5.7	0.05
Carcass temperature 1h, °C	32.5	32.2	33.1	0.66
Carcass temperature 24h, °C	2.0	1.8	1.9	0.23

[a,b] Different letters in the same row differ (P<0.05).
[1] CON - control diet; RAC – ractopamine hydrochloride; ZIL - zilpaterol hydrochloride.

CONCLUSION

Immunocastration dos not affect muscle increase but decreases some body fat depots. The βAA ZIL and RAC have different effects on carcass traits, with more pronounced effects of ZIL that increase muscle and reduces fat gains.

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