



Feeding surgically castrated, entire male and immunocastrated pigs with different levels of amino acids and energy at constant protein to energy ratio with or without ractopamine



E. Lanferdini^{a,*}, P.A. Lovatto^a, R. Melchior^a, U.A.D. Orlando^b, M. Ceccantini^c, E. Poleze^d

^a Departamento de Zootecnia, Universidade Federal de Santa Maria, 97105-900 Santa Maria, Rio Grande do Sul, Brazil

^b Brasil Foods, 80030-200 Curitiba, Paraná, Brazil

^c Adisseo Latin America, 05804-900 São Paulo, São Paulo, Brazil

^d Pfizer Saúde Animal, 04717-004 São Paulo, São Paulo, Brazil

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ABSTRACT

The study was carried out to evaluate the performance and carcass traits of surgically castrated entire male and immunocastrated pigs fed diets containing different levels of amino acids and energy with or without ractopamine. Seventy-two pigs with average initial weight of 20 kg were used. Pigs were assigned to 4 treatments, surgically castrated pigs fed control diet, entire male pigs fed control diet, entire male pigs fed control diet + 3% amino acids and energy, or entire male pigs fed control diet + 5% amino acids and energy with 6 pens and 3 pigs per pen in a completely randomized design. The first dose of immunocastration vaccine was administered when the entire male pigs reached average live weight of 65 kg. The second dose of immunocastration vaccine was administered 28 d before slaughter, and 5 ppm of ractopamine was added to the diet of half of the pens for each treatment at that time. Twenty-four pigs (1 per pen) were selected based on the average pen weight and slaughtered. Entire male pigs had 11% lower ($P < 0.05$) feed intake and improved ($P < 0.05$) feed efficiency by 15% compared to surgically castrated pigs. Supplementation with 3% and 5% of amino acids and energy did not change the daily feed intake and feed efficiency of entire male pigs. Surgically castrated pigs fed with control diet without ractopamine reached the slaughter age 5.5 kg lighter ($P < 0.05$) than those fed the diet with ractopamine. Compared to immunocastrated pigs fed diets with different nutritional levels and with or without ractopamine, they were, on average, 13 kg lighter ($P < 0.05$). Unlike growth performance, diets did not influence the carcass characteristics of surgically castrated and immunocastrated pigs. The addition of ractopamine to the diet increased ($P < 0.05$) initial and final body weights, hot carcass dressing percentage, and muscle thickness of surgically castrated and immunocastrated pigs. In conclusion, the addition of amino acids and energy improved the growth performance of immunocastrated pigs, and ractopamine increased body weight, carcass dressing percentage, and muscle thickness of surgically castrated and immunocastrated pigs.

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1. Introduction

The consumer is asking producers to pay more attention to the animal welfare and sustainability of pig production. Immunological castration has been proven to be a practice capable of meeting the consumer

* Corresponding author. Tel.: +55 55 3220 8083;

fax: +55 55 3220 8692.

E-mail address: eloiza_lanferdini@yahoo.com.br (E. Lanferdini).

demands (Cronin et al., 2003). The immunocastration consists of vaccination of animals with a modified form of GnRH conjugated to a protein that induces the formation of anti-GnRH (Zamaratskaia et al., 2008). The method avoids the occurrence of boar taint, but it can take advantage of beneficial effects of testicular steroids, anabolic hormones natural to the entire males. The production of entire male pigs has been a very attractive practice, especially from the economic point of view. The entire male has a greater genetic potential for protein deposition and improved feed efficiency (Pauly et al., 2009).

The genotype, body weight, and sex are the main factors that influence protein deposition in pigs, thus, the immunocastration can change the Lys requirements of those pigs (Andersson et al., 1997). The efficiency of Lys use for protein gain is related to the concept of ideal protein (Wecke and Liebert, 2009). Therefore, the response of animals is affected by the ideal balance of amino acids and energy (Kim et al., 2009).

Another compound that can improve growth performance and increase the production of meat is ractopamine (Dunshea et al., 1993). Beta-adrenergic agonist of phenethanolamines group, ractopamine, is the nutritional alternative commonly used in animal production. It acts as a nutrient partitioning agent and improves nitrogen retention, growth rates, and deposition of muscle tissue, and reduces fat deposition (Armstrong et al., 2004).

In Brazil, the production of entire male pigs has been adopted so fast, and feed and nutrition strategies have not kept up with the trend. The demands of amino acids, protein, and energy for different sex categories are not always provided in tables of requirements. The adjustment in the level of Lys, protein, and energy of diet and the use of additives in diets for entire male and immunocastrated pigs can result in better productive responses. Therefore, the aim of this study was to evaluate the growth performance and carcass traits of surgically castrated, entire males, and immunocastrated pigs fed diets containing different levels of amino acids and energy with or without ractopamine.

2. Material and methods

The experiment was conducted at the Swine Sector of the Animal Science Department at the Universidade Federal de Santa Maria (Santa Maria, RS, Brazil), and the protocol was approved by Internal Ethics Committee on Animal Experiments (no. 003/2011). Seventy-two, genetically homogeneous and high-genetic potential pigs (surgically castrated and entire males) with average initial weight of 20 kg and average age of 63 d were used. The pigs were housed in pens (4.5 m²) with concrete floor and equipped with feeder and nipple drinker.

The experimental design was completely randomized with 4 treatments, surgically castrated pigs fed control diet, entire male pigs fed control diet, entire male pigs fed control diet+3% amino acids and energy, or entire male pigs fed control diet+5% amino acids and energy, with 6 pens and 3 pigs per pen. For the diets supplemented with amino acids, Lys, Met, and Thr were included. The ratio of amino acid to energy was maintained in all treatments.

The first dose of immunocastration vaccine (Improvac Pfizer Ltd., Parkville, Vic, Australia) was administered when the entire male pigs reached average live weight of 65 kg and the second dose was administered 28 d before slaughter. Two milliliters per dose was administered following the guidelines of the company that provided the vaccine. After the second dose of immunocastration vaccine, the entire male pigs were considered immunocastrated pigs. At that time, 5 ppm of ractopamine (Paylean; Elanco Animal Health, NSW, Australia) was added to diet of half of the pens for each treatment. The experimental period was 103 d.

The commercial diets (Table 1) met or exceeded the nutritional requirements of the genetic type of pigs used in the experiment. The chemical analysis of the diet ingredients was determined according to the recommendations of the AOAC (1990) and total amino acids by HPLC (LAMIC, Santa Maria, Brazil). The basal diet (commercial) was common to all treatments and consisted of, on average, 92% of the total diets with increased nutritional levels. The differential fraction of 8%, on average, was added later. The experimental period was divided into 4 phases, according to the age of pigs and change of feed. These were: initial (63–84 d), grower (85–112 d), finisher I (112–140 d), and finisher II (140–165 d). The finisher II diets were provided for 28 d before slaughter to surgically castrated and immunocastrated pigs. The diets were provided ad libitum and the animals had free access to water.

Pigs were slaughtered in commercial abattoirs certified by the Ministry of Agriculture of Brazil. Twenty-four pigs (1 per pen) with the average pen weight were selected and slaughtered. The daily feed intake was obtained by weekly weighing of feed offered minus leftovers. The weight gain was determined by weighing the individual animals weekly. Carcass length was measured from the cranial edge of the pubic symphysis to the skull-ventral edge of the atlas vertebra. The fat and muscle thickness were measured with calipers between the 10th and 11th rib.

For the analysis of growth performance variables, PROC MIXED of SAS (SAS Inst. Inc., Cary, NC) was used. The post-slaughter data were subjected to analysis of variance by GLM procedure (Minitab 15; Minitab Inc., State College, PA, USA), using the slaughter weight as a covariate. Differences between means were compared by Tukey test at 5% significance.

3. Results

The performance of surgically castrated and entire male pigs is presented in Table 2. The daily feed intake differed ($P < 0.05$) between surgically castrated and entire male pigs throughout the experimental period, with, on average, 11% lower in entire male pigs. The sex influenced ($P < 0.05$) feed efficiency. The entire male pigs had improved ($P < 0.05$) feed efficiency by 15% compared to surgically castrated pigs. Supplementation with 3% and 5% of amino acids and energy did not change the daily feed intake and feed efficiency of entire male pigs. Surgically castrated and entire male pigs fed with different nutritional levels did not differ in weight gain and body weight.

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