



Effects of feeding ractopamine to physically castrated barrows, immunologically castrated barrows, and gilts on carcass characteristics, cutting yields, and fresh meat quality

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ABSTRACT

Ninety carcasses were used to evaluate the effects of feeding ractopamine (RAC) to gilts, physically castrated (PC) barrows, and immunologically castrated (IC) barrows. Finishing diets (0, 5, and 7.5 mg/kg RAC) were fed for the last 26 d before slaughter starting 7 d after the second dose of Improvest. Carcasses from IC barrows had less ($P < 0.01$) fat and had a greater carcass weight ($P = 0.02$) than PC carcasses but had more ($P \leq 0.04$) fat than gilt carcasses. Feeding RAC increased ($P = 0.03$) bone-in carcass yields by 1.4 percentage units.

Gilt and IC carcasses had 2.0 percentage units greater ($P < 0.01$) boneless lean yields, 1.8 percentage units greater ($P = 0.01$) bone-in lean yields, and 1.5 percentage units greater ($P = 0.04$) bone-in carcass yields than PC carcasses. Loin firmness, pH, and marbling were unaffected by sex and RAC feeding ($P \geq 0.22$). Bellies from IC carcasses were 0.3 cm thinner ($P \leq 0.05$) than PC but 0.3 cm thicker ($P \leq 0.05$) than gilts. Flop distances of IC bellies were similar to gilt bellies but reduced ($P \leq 0.05$) 13 cm compared with PC bellies. Iodine values of IC bellies were similar to PC bellies but reduced ($P \leq 0.05$) 3 units compared with gilts. Feeding RAC did not affect ($P \geq 0.23$) fresh belly characteristics. Overall, immunological castration and feeding RAC were additive in terms of improving carcass cutability but had only minimal effects on fresh pork loin or belly quality.

Key words: carcass, immunological castration, pork quality, ractopamine

INTRODUCTION

Ractopamine hydrochloride (RAC) is a β -adrenergic agonist for use in finishing swine diets. In numerous studies, feeding RAC increased ADG and improved feed efficiency of finishing pigs (Apple et al., 2007b; Patience et al., 2009; Boler et al., 2014a) and also increased carcass weights and muscling (Carr et al., 2009; Kutzler et al., 2011; Boler et al., 2014a). Carcasses from RAC-fed pigs have increased carcass cutting yields when compared with those from control-fed pigs (Fernandez-Duenas et al., 2008; Boler et al., 2014a). Furthermore, prior research indicated that feeding RAC had little effect on fresh meat quality including color, marbling, and firmness scores (Apple et al., 2007b; Kutzler et al., 2011) as well as fresh belly characteristics including thickness and firmness (Scramlin et al., 2008; Carr et al., 2009; Boler et al., 2014a).

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Improvest (Zoetis, Kalamazoo, MI) is an immunological product that suppresses testicular function and reduces boar taint in intact male pigs. Feed efficiency and ADG were increased in immunologically castrated (IC) compared with the physical castrated (PC) barrows following the second Improvest dose (Pauly et al., 2009; Morales et al., 2011). Though DP was reduced in IC carcasses compared with PC carcasses (Morales et al., 2011; Boler et al., 2014b), IC carcasses were leaner and had greater carcass cutting yields compared with PC carcasses due to reductions in fat and increased muscling in the shoulder and ham (Pauly et al., 2009; Morales et al., 2011; Boler et al., 2012).

Feeding RAC and immunological castration were additive in terms of increasing ADG and improving feed efficiency (Rikard-Bell et al., 2009; Lowe et al., 2014b; Puls et al., 2014a,b) and also improved estimated leanness (Moore et al., 2009; Lowe et al., 2014b). Carcass cutting yields from RAC-fed immunologically castrated barrows had less fat, greater bone-in and boneless cutability yields, and greater total cutting yields compared with control-fed PC carcasses (Lowe et al., 2014a). However, carcass cutting yields, loin quality, and belly characteristics of PC, IC, and gilts fed varying levels of RAC has yet to be reported. Therefore, the objective of this study was to evaluate the effects of feeding 2 different levels of RAC to PC barrows, IC barrows, and gilts on carcass characteristics, cutting yields, and fresh meat quality. Whereas the effects of RAC and immunological castration were expected to be additive in terms of carcass yield, neither technology was expected to have significant detrimental effects on meat quality.

MATERIALS AND METHODS

Animals used during this study were cared for in accordance with University of Illinois Animal Care and Use Committee guidelines. Pigs were humanely slaughtered at a federally inspected processing facility,

and primals were transported to the University of Illinois for further data collection.

Animals and Housing

The live phase procedures of this study are published with full details elsewhere (Puls et al., 2014a). In short, 180 pigs (Genetiporc G-performer sires × Fertilis 25 dams; Genetiporc, Alexandria, MN) blocked into 2 groups based on the starting date of the study were used. At birth, male pigs within a litter were randomly allotted to 1 of 2 castration methods: (1) to be physically castrated (PC) or (2) to be immunologically castrated (IC). Pigs in the PC group were physically castrated according to United States production standards at 5 ± 2 d of age. Intact males in the IC group were immunologically castrated by administering one dose (2 mL; s.c. into the postauricular region of the neck) of Improvest (gonadotropin releasing factor analog diphtheria toxoid conjugate, 0.2 mg/mL; Zoetis) at 16 wk of age and another 2-mL dose at 20 wk of age. Improvest dosages were administered by trained personnel. Prior to allotment in the finishing barn, contemporary gilts that were approximately the same weight as PC barrows were selected. Pigs within each sex category were individually weighed and assigned to pens so that pen means within each sex category were equal. Within each group, pens were randomly assigned to RAC, commercially available as Paylean (Elanco Animal Health, Greenfield, IN), finishing diet treatments where the feeding level was 0 mg/kg (control), 5 mg/kg, or 7.5 mg/kg RAC initiated 7 d after the second Improvest dose and fed for the last 26 d of finishing. Pigs were slaughtered at approximately 25 wk of age; IC barrows were slaughtered approximately 5 wk after the second dose of Improvest. Each pen contained 4 pigs, and the final allotment consisted of 45 pens ($n = 5$ pens for each sex × RAC level combination) with a floor space of 1.15 m² per pig and a single-space feeder and one nipple-type water drinker per pen.

The finishing barn was mechanically ventilated with part-hard, part-slatted concrete floors.

Diets

Prior to finishing, all pigs were fed the same grower diet program where diets were formulated to meet or exceed NRC (1998) nutrient requirements for intact male pigs. Similarly, finishing diets were formulated to meet the nutrient requirements for intact males fed 7.5 mg/kg RAC. Ractopamine was fed at the expense of corn, and all diets contained equal amounts of CP and standardized ileal digestible lysine. Full diet details are available elsewhere (Puls et al., 2014a).

Slaughter and Carcass Collection

At the conclusion of the finishing phase, pigs were individually weighed and the 2 pigs closest to the pen mean were selected for further analyses and tattooed on the shoulder, loin, and ham for identification in the plant. Pigs (177 in total) were loaded onto commercial trucks and transported (960 km) to a federally inspected slaughter facility. Pigs were held overnight with access to water before being slaughtered according to industry standards using carbon dioxide stunning. Hot carcass weights were collected following slaughter, and carcasses were spray chilled (-2°C) for approximately 20 h. Following chilling, left sides of carcasses previously identified for carcass cutting yields and meat quality evaluations were selected. Shoulder, ham, and loin-belly primals were packaged and transported under refrigeration to the University of Illinois Meat Science Laboratory for further data collection.

Carcass Characteristics and Loin Quality

Upon arrival, primals were unloaded and stored under refrigeration (2°C) before fabrication. Loins were separated from bellies by making a straight

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