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THE EFFECT OF RACTOPAMINE ON LEAN DISTRIBUTION AND PROCESSING YIELDS OF SWINE

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INTRODUCTION

The efficacy of the ß-agonist RAC in the repartitioning of fat and lean deposition in swine has been widely studied, but little has been reported regarding the differential response of the various muscle groups and the consequent difference in yield of retail cuts observed between treated and control animals. This paper examines this possibility of a differential response as well as the suitability of the leaner cuts produced by RAC administration for further processing.

MATERIALS AND METHODS

One hundred and twenty-eight 64kg crossbred barrows and gilts were administered either 0 or 20ppm RAC in a pelleted corn-soy diet. Following slaughter, one side of each carcass was separated into the following retail cuts: bone-in, skin-on picnic and ham; bone-in butt and loin with 6mm fat cover; and boned, skinned and squared belly. The weight of each cut was recorded.

Loin eye area (LEA) was determined on the *l.dorsi* muscle at mid-loin (approximately the 14th rib). Overall belly thickness and total thickness of lean only were measured at the centre of the anterior end of the fresh squared belly.

Both bellies and hams were needle-pumped to 126 and 129% of their fresh weight respectively. The meat was left to equilibrate in the brine overnight, re-weighed, cooked in the smokehouse and weighed a final time after a cooling period.

Boned freeze-dried ground samples of fresh loin were subjected to chemical analysis for water, protein, fat and ash (AOAC, 1984).

RESULTS AND DISCUSSION

Weight comparison of similarly prepared retail cuts from control and treated animals revealed that there was very little difference in butt and picnic weights (Table 1) but, in moving posteriorly, weight differences increased between treatments. Both belly and loin weights were 230g greater ($P<0.05$) in RAC-treated pigs than in the control animals. A larger difference of 290g ($P<0.01$) was evident in ham weights. Gu *et al.* (1991) also recently reported results of a carcass dissection in which RAC was found to increase lean ham more than the lean weights of loin or shoulder. Muscles of the shoulder of the swine ten to have a slower rate of development in relation to muscles of the loin, belly and ham, and shoulder muscles also tend to have a higher proportion of white muscle fibres (Swatland, 1984). Williams *et al.* (1984) found that the density of β^2-receptors increased with the increasing oxidative capacity of skeletal fibres. This suggests that the white muscle fibres of the shoulder should respond to RAC less readily than red muscle fibres. This is supported by the observation in the present experiment of similar retail shoulder weights between treatments.

The increased lean deposition in the loin of pigs fed RAC was reflected in a 4.01cm^2, or 9% increase ($P<0.01$), in the LEA. Chemical analysis of the loin also reflected the unmistakable repartitioning effect of RAC (Table 2) with a significant increase in the percentage of protein and a significant decrease in the percentage of fat ($P<0.01$).

Very lean bellies are often quite thin and flaccid. Commercially, these are not favoured by processors because they prove difficult to skin and pump, and often do not hold the cure well. The increase in belly weight of pigs fed 20ppm RAC proved to be due to a change in belly leanness and not in thickness (Table 1). The overall belly thickness was similar for both treatments, but the total lean thickness was 4.26mm, or 22% greater ($P<0.01$) for treated animals. This increased lean content may explain why bellies from pigs receiving RAC retained more brine ($P<0.05$) than those from their control counterparts (Table 3). Final processing yields of bellies from RAC-treated pigs were not adversely affected by the increased leanness (Table 3).

The processing of hams from RAC-treated pigs appeared to be favourable at every step (Table 3). Although all hams were pumped to approximately 129% of their fresh weight, the heavier hams from the RAC-fed animals absorbed and retained more brine than the control animals. During the curing and cooking processes that followed, hams from both treatments lost similar percentages of brine and moisture. Due to the increased acceptance and retention of needle-pumped brine by the highly muscled hams from RAC-treated pigs, cooking yields were close to 100%, which was significantly greater than controls.

CONCLUSION

The use of 20ppm RAC in the diet of swine throughout the 64 to 98kg growing period resulted in an increased lean disposition and decreased fat deposition. These changes occurred but in an uneven manner on the carcass with the degree of difference increasing from the anterior to the posterior retail cuts. The use of RAC also appeared to produce bellies and hams that responded well to processing.

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Table 1. Effect of RAC on trimmed weights of pork cuts from a four-way commercial swine cross (LSMSE).

Item	RAC (ppm) 0	20	P
Picnic, kg	3.36 ± 0.04	3.42 ± 0.04	NS
Butt, kg	3.00 ± 0.04	3.03 ± 0.04	NS
Loin, kg	6.50 ± 0.08	6.73 ± 0.08	0.05
Belly, kg	3.59 ± 0.07	3.82 ± 0.07	0.05
Ham, kg	8.50 ± 0.06	8.79 ± 0.06	0.01
Loin eye area[a], cm^2	40.62 ± 0.80	44.63 ± 0.83	0.01
Total belly thickness, mm	30.76 ± 0.71	32.46 ± 0.70	NS
Lean belly thickness, mm	15.08 ± 0.86	19.34 ± 0.84	0.01

[a] Measured at the 14[th] rib.

Table 2. Effect of RAC on chemical composition of fresh loin from a four-way commercial swine cross (LSMSE).

Item	RAC (ppm) 0	20	P
Loin			
DM, %	38.42 ± 0.38	35.35 ± 0.36	0.01
Protein, %	46.92 ± 0.95	53.90 ± 0.94	0.01
Fat, %	52.09 ± 0.90	45.71 ± 0.92	0.01
Ash, %	2.60 ± 0.60	2.89 ± 0.05	0.01

Table 3. Effect of RAC on processing characteristics of ham and bellies from a four-way commercial swine cross (LSMSE).

Item	RAC (ppm) 0	20	P
Ham			
Fresh, kg	8.34 ± 0.06	8.60 ± 0.07	0.01
Pumped, kg	10.60 ± 0.18	11.33 ± 0.18	0.01
Cured, kg	10.04 ± 0.11	10.53 ± 0.11	0.01
Cooked, kg	8.04 ± 0.10	8.56 ± 0.11	0.01
Yield[a], %	96.42 ± 0.76	99.49 ± 0.78	0.01
Bacon			
Fresh, kg	3.60 ± 0.08	3.79 ± 0.08	NS
Pumped, kg	4.50 ± 0.14	4.77 ± 0.14	NS
Cured, kg	4.00 ± 0.12	4.39 ± 0.12	0.05
Cooked, kg	3.43 ± 0.08	3.69 ± 0.08	0.05
Yield[a], %	95.53 ± 1.09	97.10 ± 1.09	NS

[a] % yield = (cooked wt/fresh wt) x 100