EFFECTS OF ZILPATEROL AND ITS WITHDRAWAL ON CARCASS AND MEAT QUALITY OF YOUNG STEERS

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ABSTRACT Medium maturity (Sussex x Brahman) weaner steers (80) were fed a balanced ration (10.7 MJ ME/kg DM) for 49 days from an average initial weight of 264 kg. Zilpaterol was administered through the feed: (1) 0.0 mg/kg; (2) 0.15 mg/kg during this period, followed by withdrawal periods of either 0, 7 or 14 days when the dosage was 0.0 mg/kg or 0.05 mg/kg. A sample of steers was slaughtered after 49 days at slaughter weights of (1) 325 kg and (2) 332 kg, and after 7 and 14 days withdrawal. In the young steers and over the relatively short feeding period Zilpaterol improved ADG and FCE ($P<0.05$), decreased rib cut fat content by 12 %, improved lean content by 4.5 %, had no significant effect on cooking loss and shear force, lowered the proportion of myristic acid ($P<0.01$) and increased oleic acid ($P<0.01$) in the subcutaneous fat. Withdrawal and reduced treatment had no significant effect on carcass and meat characteristics. Residues in the *M. Longissimus dorsi thoracis* were 0.21 ng/g after 24 hour withdrawal and 0.20 ng/g after 7 days. Residue differences between the reduced treatment (0.05 mg/kg) and control (0.0 mg/kg) were non significant.

INTRODUCTION Zilpaterol is a ß-adrenergic agonist that was investigated as a possible contributive means to improving production efficiency without risk to the consumer and retention of meat quality attributes. The aim of this study was to investigate the effects of Zilpaterol on the feedlot growth efficiency of cattle, carcass lean content, meat quality and the levels of residues in the muscle and liver following withdrawal.

MATERIALS AND METHODS The experiment consisted of a 21-day adaptation period, followed by a feedlot treatment growth period of 49 days and withdrawal periods of 7 and 14 days, carcass and meat quality evaluation and the determination of Zilpaterol residues in the muscle and liver.

There were six treatment groups in the feedlot treatment growth and withdrawal periods. Treatment 1, the control, received 0.0 mg/kg Zilpaterol, and had 15 replicates in the growth phase, 10 replicates in the first 7 days after withdrawal and 5 replicates in the second 7 days after withdrawal. Treatments 2, 3, 4, 5 and 6 consisted of 13 replicates and each received a Zilpaterol treatment of 0.15 mg/kg LW/day. Treatment 2 was slaughtered at the end of the 49-day feedlot treatment period, with a 24 hour withdrawal period. Treatments 3 and 5 received 0.0 mg/kg Zilpaterol during the withdrawal period and were slaughtered at 7 and 14 days after withdrawal, respectively. Treatments 4 and 6 received 0.05 mg/kg LW/day, a lower Zilpaterol concentration than in the feedlot treatment growth period, and were slaughtered at 7 and 14 days after withdrawal, respectively.

The 80 crossbred weaner steers were of a medium maturity type (Sussex x Brahman). On arrival at the experimental farm, the animals were allowed to rest and provided with *Eragrostis tef* hay for the first eight days and fresh drinking water. They were processed according to normal procedures within the first week, weighed, ear tagged, dehorned and randomly allocated to treatments. After the first eight days the steers were gradually changed-over from hay to a complete feedlot diet which provided 10.7 MJ ME/kg DM, over the next fourteen days. The prophylactic treatments, administration of Zilpaterol, feeding of the steers, data collection and processing were done as described by Casey, Montgomery and Scheltens in their paper published in the proceedings (Proceedings, ICOMST, 1997). Liver and SCF samples were collected on the slaughter line. Fatty acids and Zilpaterol residues were determined.

The data were statistically analysed by the Statistical Analysis Systems (SAS, 1985), using PROC MEANS, PROG GLM and PROC REG where applicable. The results are given as least square means and standard deviations of the various parameters.

RESULTS The feedlot performances (least square means of the steers were respectively for the Control (0.0 mg/kg) and Treatment (0.15 mg/kg): Initial weight (kg) 264.6 ± 7.4 and 262.8 ± 3.6; final weight (kg) 325.3 ± 8.5 and 331.8 ± 4.1; ADG (kg/d) 1.24 ± 0.07 and 1.41 ± 0.03 ($P=0.024$); ADFI (kg/d) 6.90 ± 0.20 and 7.09 ± 0.10; ADFI (g/d/kg $M^{0.75}$) 97.1 ± 2.5 and 98.9 ± 1.2; FCE (kg DM/kg) 5.56 ± 0.24 and 5.03 ± 0.12 ($P= 0.019$). Carcass parameters were: WCW(kg)181.6 ± 14.2 and 185.5 ± 18.7; CCW (kg) 178.4 ± 15.0 and 181.5 ± 19.3; dress% 56.3 ± 3.30 and 54.8 ± 1.7; SCF13 (mm) 2.4 ± 0.40 and 2.3 ± 0.8.

During the 7-day withdrawal phase the feedlot performances were respectively for the Control (0.0mg/kg in the growth period), and Treatments 0.0mg/kg and 0.05mg/kg in the withdrawal phase: Initial weight (kg) 325.3 ± 28.4, 336.0 ± 35.6 and 325.8 ± 30.5; final weight (kg) 335.3 ± 28.9, 346.2 ± 34.7 and 336.0 ± 29.7; ADG (kg/d) 1.43 ± 0.3, 1.46 ± 0.5 and 1.47± 0.7; ADG (g/d/kg $W^{0.75}$) 18.5 ± 4.2, 18.6 ± 7.1 and 19.3 ± 9.2; ADFI (kg/d) 7.09 ± 1.27, 7.91 ± 0.9 and 6.95 ± 1.49; ADFI (g/d/kg $M^{0.75}$) 91.5 ± 14.0, 100.8 ± 9.7 and 91.43 ± 16.4; FCE (kg DM/kg) 4.96 ± 0.97, 5.42 ± 5.7 and 4.73 ± 3.5. Carcass parameters were: WCW (kg)191.2 ± 17.4, 191.2 ± 18.0 and 189.7 ± 20.8; CCW (kg) 187.3 ± 17.9, 186.9 ± 18.6 and 185.9 ± 20.9; dress% 54.6 ± 2.10, 54.6 ± 0.80 and 54.4 ± 1.50; SCF13 (mm) 2.6 ± 0.80, 2.6 ± 1.10 and 2.6 ± 1.00.

During the 14-day withdrawal phase the feedlot performances were respectively for the Control (0.0 mg/kg in the growth period), and Treatments 0.0 mg/kg and 0.05 mg/kg in the withdrawal phase: Initial weight (kg) 327.4 ± 20.6, 349.0 ± 34.3 and 335.8 ± 21.3; final weight (kg) 336.4 ± 24.4, 358.1 ± 35.5 and 344.33 ± 21.2; ADG (kg/d) 1.29 ± 0.6, 1.30 ± 0.6 and 1.20 ± 0.5; ADG (g/d/kg $M^{0.75}$) 16.2 ± 6.6, 15.9 ± 6.9 and 15.2 ± 6.4; ADFI (kg/d) 7.42 ± 0.8, 8.1 ± 1.2 and 7.43 ± 1.4; ADFI (g/d/kg $M^{0.75}$) 93.3 ± 7.6, 98.7 ± 13.0 and 94.3 ± 20.9; FCE (kg DM/kg) 5.75 ± 4.2, 6.23 ± 3.9 and 6.19 ± 3.34. Carcass parameters were: WCW (kg 191.0 ± 12.6, 196.1 ± 18.1 and 192.6 ± 15.0; CCW (kg) 188.8 ± 13.4, 194.0 ± 18.9 and 190.3 ± 15.5; dress% ^{a}56.9 ± 2.10, 55.2 ± 1.50 and ^{b}54.5 ± 2.20 ($P<0.05$); SCF (mm) 4.5 ± 0.90, 3.3 ± 1.40 and 3.8 ± 1.30.

Compositional characteristics of the rib-cuts which were taken as estimates of carcass compositions at the end of the 49-day feedlot growth

period were SCF (%) 7.1 ± 1.0 and 6.7 ± 0.8; IMF (%) 11.3 ± 2.7 and 9.5 ± 2.5; Total fat (%) 18.4 ± 2.6 and 16.2 ± 2.3; lean (%) 62.8 ± 3.2 and 66.0 ± 2.1; bone (%) 18.7 ± 1.4 and 17.8 ± 0.5; lean to bone ratio 3.4 ± 0.4 and 3.7 ± 0.1; lean to fat ration 3.4 ± 0.8 and 4.1 ± 0.7. The specific chemical components on an 'as is' basis were: Moisture (g/kg) 676.9 ± 3.7 and 686.5 ± 2.0; potein (g/kg)147.4 ± 0.8 and 151.7 ± 1.4; fat (g/kg)155.4 ± 3.3 and 139.2 ± 1.1; ash (g/kg) 11.6 ± 0.01 and 12.0 ± 0.02. On DM basis the compositions were: Protein (%) 47.4 ± 8.2 and 50.3 ± 2.6; fat (%) 49.9 ± 5.0 and 46.2 ± 2.3; fat:CP 1.1 ± 0.3 and 0.9 ± 0.1.

The effects of Zilpaterol on percentage cooking loss were: Control (0.0 mg/kg) 25.7 % and Treatment (0.15 mg/kg) 26.2 % (NS), and on shear force: Control (0.0 mg/kg) 90.2 N and Treatment (0.15 mg/kg) 111.9 N (NS).

The residues (ng/g) of Zilpaterol in muscle (*M longissimus dorsi thoracis)* of steers following withdrawal were: 24 hours after the last Zilpaterol was administered at 0.15 mg/kg, 0.21 ± 0.03 ng/g, and after withdrawal of 7-days, 0.20 ± 0.0 ng/g. Zilpaterol residues in liver were: 24 hours after the last Zilpaterol was administered at 0.15 mg/kg, 0.27 ± 0.10 ng/g and after withdrawal of 7-days, 0.17 ± 0.05 ng/g.

The effects of Zilpaterol on the fatty acid profile of the SCF the end of the feedlot treatment growth period for the 0.0 and 0.15 mg/kg treatments were C14:0 6.60 ± 1.12 and 5.62 ± 0.99 ($P<0.01$); C15:0 1.91 ± 0.66 and 1.62 ± 0.68; C16:0 24.92 ± 1.36 and 24.60 ± 1.68; C16:1 7.45 ± 0.59 and 7.40 ± 0.80; C18:0 13.97 ± 2.16 and 13.62 ± 2.44; C18:1 40.44 ± 1.88 and 42.38 ± 2.43 ($P<0.01$); C18:2 3.55 ± 0.19 and 3.79 ± 0.52; C18:3 1.16 ± 0.27 and 0.97 ± 0.29. The saturated fatty acids (SFA) comprised 47.40 ± 2.17 and 45.46 ± 2.67 %, the unsaturated fatty acids (UFA) 52.60 ± 2.17 and 54.54 ± 2.67 % and the ratio SFA/UFA 0.90 ± 0.08 and 0.83 ± 0.09.

CONCLUSIONS Zilpaterol increased growth rate by 12.1 % ($P<0.05$) in medium maturity steer during a 49-day feedlot period over a weight range of 263 - 329 kg, and increased feed efficiency by 9.5 %. Zilpaterol decreased SCF by 5.8 % and intermuscular fat by 16.2 % and dissectable fat by 12.2 % with an increase in dissectable lean by 4.5 % ($P<0.05$). Zilpaterol had no effect on cooking loss or shear force value. It lowered the proportion of myristic acid ($P<0.01$) and increased oleic acid ($P<0.01$) in the subcutaneous fat. Withdrawal and reduced treatment had NS effect on carcass and meat characteristics. Residues in the *M. Longissimus dorsi* were 0.21ng/g after 24h withdrawal and 0.20 ng/g after 7 days. Residue differences between the reduced treatment (0.05 mg/kg) and control (0.0 mg/kg) were NS.

ACKNOWLEDGEMENTS The authors acknowledge the funding of this project by Hoechst Roussel Vet (France).