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A WITHIN-LITTER COMPARISON OF THE GROWTH PERFORMANCE, CARCASS CHARACTERISTICS, AND MEAT QUALITY OF HALOTHANE CARRIER AND NEGATIVE PIGS AT THREE SLAUGHTER WEIGHTS

L. M. LEACH, M. ELLIS, D. S. SUTTON, F. K. MCKEITH AND E. J. WILSON†;
Department of Animal Sciences, University of Illinois, Urbana 61801
†Pig Improvement Company, Inc., Franklin, KY

ABSTRACT

Growth performance, carcass characteristics, and meat quality of halothane carrier (Nn) and negative (NN) pigs produced within the same litter and slaughtered at three weights (110, 125, and 140 kg live weight) were studied. Daily gains were similar for the two genotypes, but Nn pigs had a higher gain:feed ratio than NN pigs ($P<.01$). Dressing percentage was significantly higher in Nn compared to NN pigs ($P<.001$), but there were no significant genotype differences for carcass length, fat thickness, or loin eye area. Percentage yield of trimmed, boneless wholesale cuts was higher for Nn pigs compared to NN pigs ($P<.05$). This resulted from higher trimmed, boneless ham, boston and picnic weights in Nn compared to NN pigs. The weight of fat free lean was significantly higher in Nn pigs ($P<.05$). The longissimus from carrier pigs had a lower 45 min and 24 h pH. Carriers had lower ($P<.001$) subjective meat quality scores and a higher drip loss ($P<.001$); however, cooking loss, eating quality, and shear force values were similar for the two genotypes. There were no important slaughter weight by genotype interactions for the traits reported. Overall, the data from this study suggests Nn pigs had an advantage over NN pigs in terms of feed efficiency, carcass yield, fat free lean content, and commercial lean cut yields, but had a higher incidence of PSE.

INTRODUCTION

With the development of the HAL-1843 DNA test (Fujii et al., 1991; Otsu et al., 1991) it has become possible to determine halothane genotype more rapidly and accurately. Commercially, the halothane gene is of interest because it results in increased carcass lean contents (Pommier et al., 1992). However, halothane reactors, in comparison with negative animals, are more stress susceptible and produce poor meat quality, particularly in terms of a higher incidence of pale, soft, and exudative (PSE) muscle (Jones et al., 1994). The carcass composition and meat quality of carriers relative to negative animals is less clear. Sather et al. (1991b, c) observed a slaughter weight by halothane genotype interaction for carcass lean content and meat quality traits. At lighter weights (i.e. around 80 kg live weight), these workers showed that the carcass composition and meat quality of carriers was similar to negative animals; whereas, at heavier weights (i.e. up to 130 kg), carrier performance was more like the reactors for these traits. The objectives of this study were to compare negative and carrier pigs produced within the same litter for growth performance, and carcass and meat quality traits at three slaughter weights which span those currently used in the US industry.

MATERIALS AND METHODS

Trial Design, Performance and Carcass Measurements
Two genotypes (halothane carrier (Nn) and halothane negative (NN)), two sexes (barrow and gilt) and three slaughter weights (110, 125, and 140 kg live weight) were evaluated. Halothane carrier and negative pigs were produced in the same litter by mating carrier boars (7 in total) to negative sows (42 in total). The halothane status of the progeny was identified using the HAL-1843 DNA test from blood taken at 21 d. A total of 144 pigs were allocated to test at a live weight of approximately 40 kg over a period of six weeks. Each week 24 pigs, comprised of equal numbers of carriers and negatives and barrows and gilts, were allocated to like-genotype, like-sex groups (four pigs per group). Each pen was designated for slaughter at either 140 kg, 125 kg, or 110 kg. Average daily gain and feed intake were measured. Pigs within 3 kg of the designated slaughter weight were taken off test for subsequent slaughter. Measurement of feed intake to calculate group feed efficiency was terminated when the first pig in the group reached designated slaughter weight. One hundred and nineteen ($n=119$) pigs randomly selected from those that reached their designated slaughter weights were slaughtered for carcass and meat quality evaluation. At 24 h postmortem, cold carcass weights were recorded, and carcass measurements were obtained on the left side of each carcass. The right side of the carcass was weighed, fabricated, and weights recorded for carcass cutting yields. The trimmed, boneless wholesale cuts underwent chemical analysis to determine moisture and fat content.

Meat Quality Measurements
Longissimus pH was evaluated at 45 min and 24 h postmortem. Longissimus color, firmness, marbling, and carcass muscling scores were taken using the procedures described by NPPC (1991). Longissimus color at the last rib (L*, a*, and b* values) was evaluated at 24 h post mortem. Five longissimus chops (2.5 cm thick) were obtained from the left side of the carcass posterior to the last rib for drip loss determination, chemical analysis of moisture and fat content, sensory evaluation, and Warner-Bratzler shear force determination.

RESULTS AND DISCUSSION

The least squares means for genotype performance, slaughter, and carcass measurements, and meat quality are presented in Table 1. Carriers had better gain:feed and dressing percentage than negatives. McPhee et al. (1994) also reported a feed efficiency advantage for carriers and reactors over negative pigs while other studies have shown no effect of the halothane gene on feed efficiency (Jensen and Barton-Gade, 1985). Pommier et al. (1992) observed an increase in dressing percentage in carriers. However, this differs from Sather et al. (1991a) who found no difference in dressing percentage between the two genotypes. Linear carcass measurements did not differ between genotypes which is consistent with other studies (Webb et al., 1994). Carriers had greater trimmed, boneless cut

Table 1. Least squares means for genotype for performance, slaughter and carcass measurements and meat quality measurements.

Variable	Genotype Nn	NN	SE	Sig
Avg. daily gain, g	974	964	16.9	NS
Gain:feed	.36	.33	.01	**
Dressing %	75.3	74.4	.29	***
Carcass length, cm	83.9	84.6	.43	NS
Tenth rib fat, cm	2.7	2.8	.10	NS
Loineye area cm²	42.9	41.5	1.20	NS
Total trimmed,				
Weight, kg	19.8	19.2	.24	**
Percentage	44.1	43.1	.49	*
45 min pH	6.4	6.6	.05	**
24 hr pH	5.6	5.7	.03	**
Minolta L*	45.7	42.0	1.03	**
Drip Loss	5.2	3.4	.43	**

NS, *, **, *** not significant, P<.05, P<.01, P<.001, resp.

yields and more kg of fat free lean than negative pigs. There were no significant genotype by slaughter weight interactions for the performance, slaughter and carcass data.

All meat quality traits were significantly different between the genotypes and indicated that carriers tended to have a higher incidence of PSE. The higher incidence of PSE in carriers compared to negatives observed in the present study is consistent with the observations of NPPC (1994). Sather et al. (1991c) reported a significant halothane genotype by slaughter weight interaction for meat quality with carrier pigs having meat quality similar to negative pigs at lighter weights but more comparable to reactors at heavier weights. There was no evidence of a genotype by weight interaction in the current study suggesting that the meat quality differences between the two genotypes was maintained across the weight range evaluated.

IMPLICATIONS

The results of this study confirm that there are advantages for producing halothane carrier compared to negative pigs in terms better feed efficiency, greater carcass yields and higher carcass lean contents. However, our results suggest that carriers have a higher incidence of PSE which will be a source of economic loss to the meat sector. The lack of any interaction between halothane genotype and slaughter weight for the growth, carcass and meat quality traits measured in this study suggest that the relative advantages and disadvantages of carriers will be maintained across the range in slaughter weights currently required by the majority of slaughter plants in the US at this time.

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