

Effects of pig breed and diet on concentrations of skatole and androstenone in subcutaneous fat

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Abstract

A study of 144 entire male pigs examined the effects of breed and diet on the boar taint compounds skatole and androstenone in loin backfat. The breeds were 75% Duroc and 75% Large White and they had been reared using nutritional strategies which supplied different levels of protein as live weight increased from 40 to 120kg. Breed was a major factor affecting skatole and androstenone, higher values of both compounds being found in Duroc. The percentage of pigs that exceeded the nominal threshold values for both skatole (0.2µg/g) and androstenone (1.0µg/g) was 14% Duroc and 2.8% Large White. In contrast to breed, there were no effects of dietary protein level on boar taint compounds.

Introduction

Boar taint describes an odour and flavour of meat from uncastrated male pigs which some people find unattractive. It is explained by high levels of skatole and androstenone in tissues, particularly fat tissue. Target thresholds above which the odours/flavours are found to be undesirable are commonly accepted to be 0.2 and 1.0 µg/g for skatole and androstenone respectively (Walstra et al, 1999). There is evidence that breed and diet affect concentrations of these compounds (Whittington et al, 2004). This study has compared Duroc and Large White (LW) breeds and ‘nutritional strategies’ providing different dietary protein intakes.

Materials and methods

144 entire male pigs were used, equal numbers of 75% Duroc and 75% LW. These were a subset of pigs from a replicated trial involving 192 animals in total. From 40 to 120 kg live weight, they were fed on three ‘nutritional strategies’ which provided different levels of energy, protein and lysine as the pigs increased in live weight. A Baseline nutritional strategy (B) provided high protein throughout (21%). A ‘State of the art’ NS (SOTA) reduced protein as the pigs increased in weight, to 17% in the stage before slaughter and a Low protein NS (LP) reduced protein further, to 13% in the final stage (Table 1). At 120 kg live weight, a sample of subcutaneous fat from the loin region was removed after slaughter and fat from both layers, excluding hair follicles, was combined and assessed for skatole and androstenone using the methods described by Whittington et al (2004). Data were analysed using GLM, with breed and nutritional strategy as factors.

Table 1. Nutritional strategies imposed on group-fed Large White and Duroc pigs

Wt range(kg)	Baseline (B)			State of the art (SOTA)			Low Protein (L P)		
	DE ^a	CP ^b	L ^c	DE	CP	L	DE	CP	L
1. 40-65	13.5	210	12	14.0	195	12	14.0	195	12
2. 65-90	13.5	210	12	13.5	180	11	13.5	165	10
3. 90-120	13.5	210	12	13.0	170	10	13.0	130	7

^a MJ digestible energy/kg ; ^b g/kg crude protein; ^c g/kg lysine

Results

Least squares means for breed and nutritional strategy are shown in Table 2. Duroc pigs had much higher levels of skatole and even more so of androstenone than LW. There were no differences due to nutritional strategy and no interactions between breed and nutritional strategy. The percentage of pigs of each breed exceeding the threshold values of 0.2µg/g for skatole and 1.0µg/g for androstenone were (skatole):

22% Duroc and 7% LW; (androstenone): 41% Duroc and 7% LW. The percentage of pigs which exceeded the thresholds for both compounds together was 14% Duroc and 2.8% LW.

Table 2. Concentrations of skatole and androstenone($\mu\text{g/g}$) in loin backfat.

	Breed			Nutritional strategy			
	Duroc	LW	Sig	B	SOTA	LP	Sign
Skatole	0.171	0.090	*	0.099	0.160	0.133	ns
Androstenone	1.285	0.416	***	0.966	0.755	0.830	ns

A plot of skatole and androstenone concentrations is in Figure 1. This illustrates the wide variation in boar taint compounds and confirms the much lower values in LW pigs.

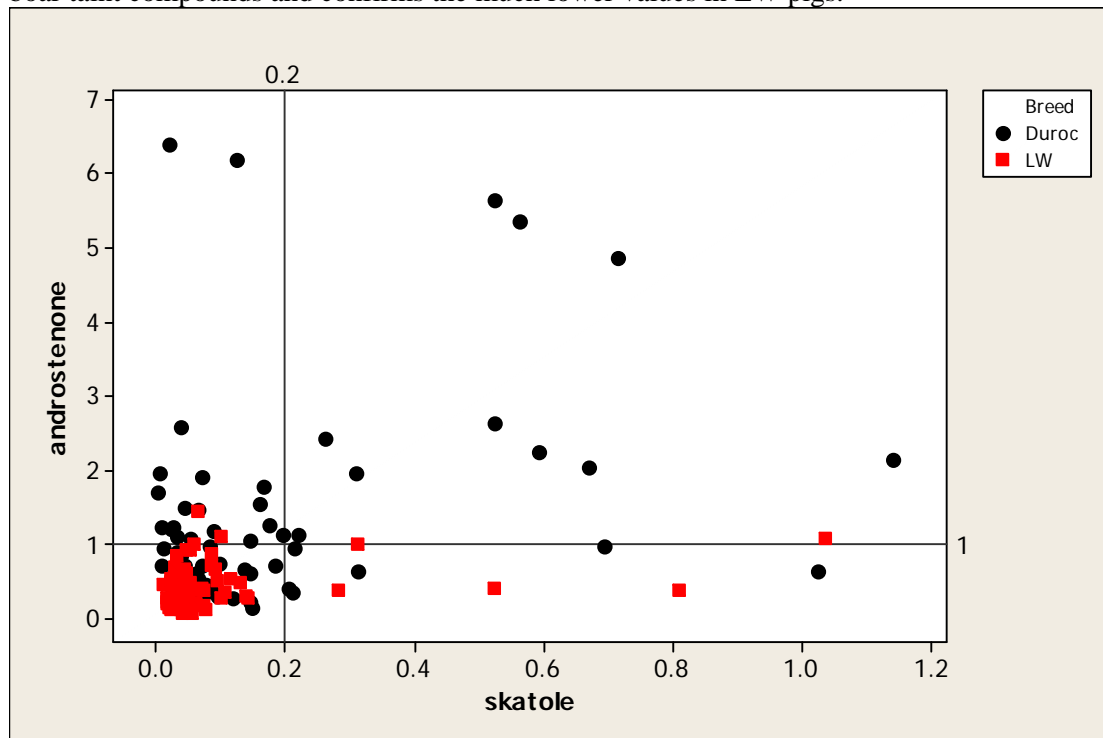


Figure 1. Skatole and androstenone concentrations in backfat.

Discussion

These results support the view that genetic factors are an important part of the variation in boar taint compounds seen in slaughter weight pigs (Whittington et al, 2004). Babol et al (2004) found higher plasma skatole concentrations in Duroc than Hampshire, Yorkshire and Landrace. In comparison, extremes of dietary protein were less important. Reasons why the rearing of entire male pigs became common in UK in 1980s probably include the fact that the LW breed was predominant then.

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References

- Babol, J., Zamaratskaia, G., Juneja, R.K. and Lundstrom, K. 2004. The effect of age on distribution of skatole and indole levels in entire male pigs in four breeds: Yorkshire, Landrace, Hampshire and Duroc. *Meat Science* 67, 351-358.
- Walstra, P., Claudi-Magnussen, C., Chevillon, P., von Seth, G., Diestre, A., Matthews, K.R., Homer, D.B. and Bonneau, M. 1999. An international study on the importance of androstenone and skatole for boar taint: levels of androstenone and skatole by country and season. *Livestock Production Science* 62, 15-28.
- Whittington, F.M., Nute, G.R., Hughes, S.I., McGivan, J.D., Lean, I.J., Wood, J.D. and Doran, O. 2004. Relationships between skatole and androstenone accumulation and cytochrome P4502E1 expression in Meishan x Large White pigs. *Meat Science* 67, 569-576.