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Evolution of the meat/fat accretion and the body composition of meat pigs up to 70 kg

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Abstract
Knowledge of the lean gain is required for the factorial derivation of nutrient requirements. To date there are no compositional data available for the in Belgium very popular Piétrain x hybrid fattening pig. Therefore, the meat/fat accretion and the body composition was studied by the slaughter technique, at 8, 30, 50 and 70 kg live weight. Four barrows and 4 gilts were slaughtered at 8 and 30 kg; 8 barrows and 8 gilts were slaughtered at 50 and 70 kg. Pigs were fed a well-balanced protein rich feed to allow optimal growth. Body, carcass and offal were analysed for protein, fat, ash and phosphorus. From 8 to 30 kg the lean gain amounted to 400 g/d for barrows and gilts, from 30 to 50 kg the lean gain was higher for gilts (506 g/d) than for barrows (491 g/d). Between 50 and 70 kg, gilts increased lean gain with 531 g/d, whereas barrows were already over the top with 450 g/d. The body's fat content was similar for both sexes at 8, 30 and 50 kg with respectively 11, 11 and 15%. At 70 kg the pig's fat content was 23% for barrows and 17% for gilts. This confirms the decrease in lean gain in barrows between 50 and 70 kg.

Introduction
In this trial the body composition was studied at different ages with the aim of following the evolution of the meat/fat gain. Knowledge of the evolution of the meat/fat accretion can be implemented when estimating nutrient requirements by the factorial approach and when choosing the phases in multiple phase feeding. Parameters like lean (meat) gain and weight gain are demanded in models like Technisch Model Varkensvoeding and the NRC-model. Apart from protein and fat, the amount of phosphorus (P), retained by the pig, is also determined, leading to an estimation of the excretion of P. The measurement of the ash content is an estimate of the proportion of skeleton in the body. No data regarding this matter have been published so far for the Piétrain x hybrid meat pig, popular in Belgium. Results of the body composition in terms of protein, fat, ash and P are presented for barrows and gilts of 8, 30, 50 en 70 kg body weight, assessed by means of the comparative slaughter technique. The body composition at 100 kg live weight will be determined in a subsequent trial.

Materials and methods
Four barrows and 4 gilts were slaughtered at on average 8 kg and 30 kg. Of the 50 kg- and 70 kg-weighing pigs, 8 barrows and 8 gilts were slaughtered each time. In the period preceding slaughter, the pigs were fed an ideal protein rich diet, allowing optimal growth, derived from former amino acid requirement trials. At slaughter, blood was collected and added to the offal. Half a carcass was cut into pieces and frozen, afterwards the carcass was milled, mixed and a sample was taken to be processed further. The milled and mixed carcass sample, as well as the offal with blood, was sterilised, homogenised and freeze-dried. The freeze-dried samples were analysed for crude protein, crude fat, ash and P. The results for protein-, fat-, ash- and P-contents, as well as the proportion carcass and offal with blood were statistically processed

with the procedure UNIANOVA (SPSS version 11.5), with as factor weight and/or sex. The obtained means were tested for significant differences by means of the Scheffé test.

Results and discussion

The proportion of carcass and the proportion of offal were not significantly influenced by sex. At 8 and 30 kg body weight, the offal was relatively more important than at the body weights 50 and 70 kg (17-18% versus 11-12 %). Body protein content was not significantly influenced by body weight in barrows (fig. 1). In gilts, however, there was a significant increase in body protein content from 8 to 50 kg body weight (fig. 2). The fat content of the body increased significantly for barrows from 50 to 70 kg (fig. 3) and for gilts from 30 to 50 kg body weight (fig. 4). Barrows were significantly fatter than gilts at 70 kg (22% versus 17%).

Fig.1. Barrows: Body protein content as a function of weight

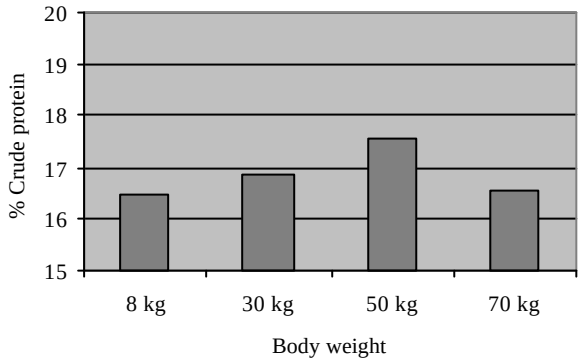


Fig.2. Gilts: Body protein content as a function of weight

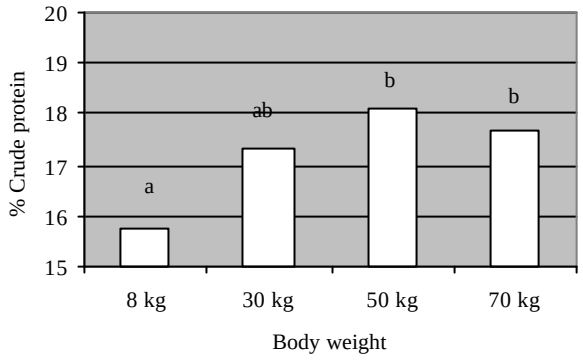


Fig.3. Barrows: Body fat content as a function of weight

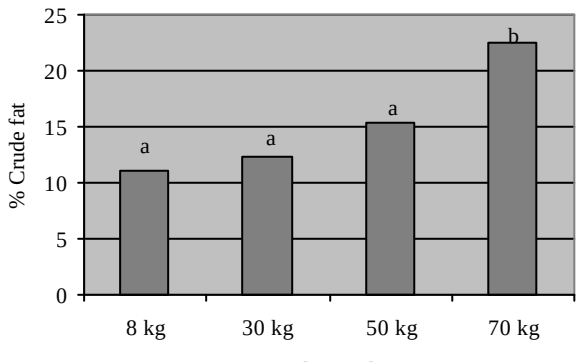
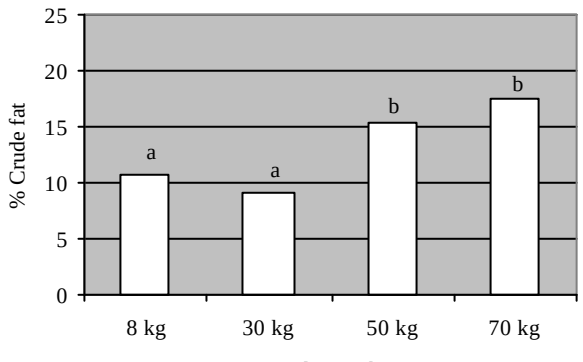


Fig.4. Gilts: Body fat content as a function of weight



In figure 5 the lean meat or muscle gain is shown for the different weight categories. The muscle gain was estimated by taking the average composition of skeletal muscle (Lawrence & Fowler, 1997) and the measured protein accretion of the carcass into account. The evolution of muscle gain was clearly different between barrows and gilts. From 8 till 30 kg body weight, muscle gain was equal for both sexes. Muscle gain from 30 till 50 kg was higher than from 8 to 30 kg body weight, with a 3% higher increase for gilts than barrows. Compared with the muscle gain in the category 30-50 kg, muscle accretion decreased for barrows and increased for gilts in the trajectory 50-70 kg body weight. Between 50 and 70 kg, muscle gain

was 18% higher in gilts than in barrows. The decreased muscle gain for barrows was reflected in an increased fat content of the carcass at 70 kg, compared with 50 kg (fig. 3). Fat gain increased with age up to 70 kg body weight for barrows (from 69 g/d for 8-30 kg to 286 g/d for 50-70 kg). In gilts, fat gain increases up to 50 kg body weight (from 44 g/d for 8-30 kg till 156 g/d for 30-50 kg) and then reaches a plateau (161 g/d for 50-70 kg). Ash and P-content of the body were not significantly influenced by sex or weight. On average bodies contained 2.86% ash and 0.50% P. The proportion of ash and thus of skeleton in the body did not change with age and was similar for both sexes.

Fig.5. Muscle gain as a function of weight and sex

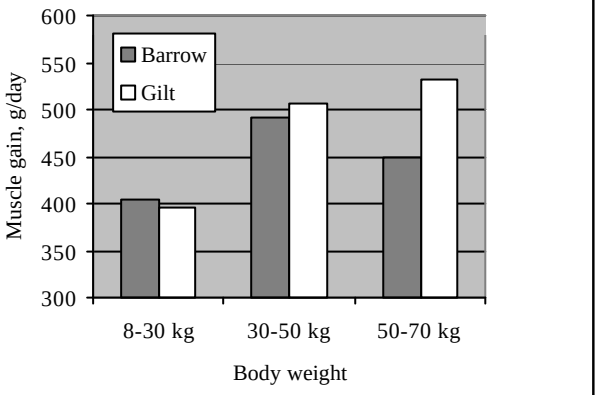


Table 1. Protein, fat and muscle gain in various studies

				Gain in g/d		
Author(s)	Genotype	Sex	Trajectory	Protein	Fat	Muscle
Present study	Pi x Hy	Ba	8-30	92	69	404
		Gi	8-30	91	44	396
		Ba	30-50	129	139	491
		Gi	30-50	125	156	506
		Ba	50-70	97	286	450
		Gi	50-70	117	161	531
Schinckel, 2001	Unspecified	Gi	58-104		150-231	322-391
		Ba	32-109			207-427
Roy et al., 2000	Yo x Fr.LR	Ba	20-65	168	233	
Eissen et al., 2000	Nl.LR, LR x Yo, LR x Yo x Du	Ba+Gi	25-65	129	157	
Quiniou et al., 1999	LW, Pi x LW	Ba+Bo	45-100	113-159	110-268	390-559
Campbell & Taverner, 1988	LW x LR	Ba	45-100	189		

Pi: Piétrain, Hy: hybrid with Landrace and Large White, Yo: Yorkshire, Du: Duroc, LW: Large White, Fr.: French, Nl.: Dutch, LR: Landrace.
Ba: barrow, Gi: gilt, Bo: boar.

Compared with other studies (Table 1), protein gain, observed in the present study, in a comparable trajectory was lower or similar. Fat gain was of the same order of magnitude or lower than the values obtained from the literature. Muscle gain was somewhat higher in this study, due to the fact that the weight range 50-70 kg was less extended than in the literature, except for Quiniou et al. (1999) who found similar values.

Conclusion

The evolution of meat and fat accretion is similar for barrows and gilts until 50 kg, afterwards muscle gain increases further for gilts, but not for barrows, resulting in a higher body fat content. Consequently, the requirement for dietary protein will be more elevated for gilts than for barrows in the weight interval 50 to 70 kg.

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