



EARNEST

EARly Nutrition programming- long term follow up of Efficacy and Safety Trials and integrated epidemiological, genetic, animal, consumer and economic research

Instrument: Integrated Project

Thematic Priority 5.4.3.1: Food Quality and Safety

Final public report on activity 3.4.2:

Prenatal dietary intervention

Period covered from 15.04.2005 to 14.10.2010

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Duration: 5,5 Years

Organisation Name of Lead Contractor for this report: Schothorst Feed Research

Introduction

Piglets are weaned at four weeks of age, with a body weight of approximately 8 kg. During a five week period, piglets generally receive two nursery diets in order to facilitate the weaning process and maximise daily growth rate during the nursery period until 25 kg body weight. Long term effects of nursery diet composition on growth rate and body composition of pigs are seldom taken into account. Nevertheless, some studies indicate that both energy and protein intake in the nursery period may influence later growth performance and body composition. Therefore the aim of this project was to study the effect of amino acid content in the nursery diets on growth performance in the nursery period and long term effects on body gain and body composition until 6 months of age.

Experimental design

The experiment was conducted according to a 2x2 factorial design with low and high amino acid levels in the nursery 1 and nursery 2 diet during a five week period from weaning. Lysine was used as reference amino acid, other essential amino acids were included in a constant ratio relative to lysine. The digestible lysine content was 8.6 and 11.6 g/kg for diets low and high in amino acid content. Nursery 1 and 2 diets were supplied during 2 and 3 weeks post weaning, respectively. Treatments and diets are summarised below.

Table 1 Experimental treatments and respective diets in the nursery period

Treat.	Diet	Diet code per period	
		Wk 1-2 post weaning	Wk 3-5 post weaning
1.	Nursery 1 diet, 8.6 g dig. lys/kg, Nursery 2 diet, 8.6 g dig. lys/kg (LL)	A	C
2.	Nursery 1 diet, 8.6 g dig. lys/kg, Nursery 2 diet, 11.6 g dig. lys/kg (LH)	A	D
3.	Nursery 1 diet, 11.6 g dig. lys/kg, Nursery 2 diet, 8.6 g dig. lys/kg (HL)	B	C
4.	Nursery 1 diet, 11.6 g dig. lys/kg, Nursery 2 diet, 11.6 g dig. lys/kg (HH)	B	D

Each treatment comprised 12 replicates (pens) with 6 pigs, Tempo x (GY x Finnish Landrace) per pen, in total 288 pigs. After the five week nursery period, pigs of two pens with the same treatment were combined in one group and housed in a building for growing-finishing pigs until they reached the commercial slaughter weight of approximately 115 kg. All pigs received 50 kg of a grower diet and a finisher diet thereafter. Piglets had free access to feed in the nursery period and received diets according to a feeding scheme in the growing-finishing period from approximately 25 to 115 kg body weight. Body weight and feed consumption of pigs were determined at weaning, 1,2, and 5 weeks post weaning (nursery period) and 4 weeks after start of the grower period. At the end of the experiment, carcass weight and composition were determined at a commercial slaughterhouse.

Results and discussion

In Table 3 and 4 results of the individual treatments and of the main effects on growth performance in the nursery period have been reported. There were no significant interactions between the treatments in nursery 1 and nursery 2 diets. In week 1 post weaning the amino acid content in the Nursery 1 diet only had numerical (non-significant) effects on growth rate of piglets. In week 2 the higher amino acid content significantly increased the growth rate by 80 g/d and improved the feed utilisation (lower feed conversion ratio) by 0.24. In week 3-5 post weaning the pigs that previously received the Nursery 1 diet with low amino acids content had a slight but significantly lower feed conversion ratio. This may imply that these pigs had somewhat reduced maintenance requirements because of their lower body weight or a somewhat lower lipid deposition in week 3-5. In week 3-5 the increased amino acid content in the Nursery 2 diet drastically increased the growth rate by 80 g/d and reduced the feed conversion ratio by 0.26. The feed intake was higher in the pigs receiving the diet with low amino acid contents. Because of the absence of interactions, the highest growth rate and final body weight was realised in piglets receiving the high amino acids content in both Nursery diets. The high amino acid content also reduced the variation in body weight within a pen of piglets receiving the same experimental diets.

The results of growth performance in the growing-finishing period from 5 weeks post weaning (approximately 25 kg) to 115 kg were presented in Table 5 and 6. These results represent the long term effects of the nursery diets. Daily growth rate was not affected by nursery diets, but the feed utilisation was significantly improved in pigs that received low amino acid diets in the nursery period. It is likely that pigs receiving a low amino acid nursery diet had a reduced protein and increased lipid deposition in that period. These pigs may have had lower maintenance requirements and/or a lower lipid/protein deposition ratio in later life, thus realising an improved feed conversion ratio.

In addition, the pigs that received the high amino acid content in the Nursery 1 diet had a significantly higher lean meat percentage and lower back fat thickness, whereas the Nursery 2 diets had no effect on these characteristics. This result suggests that the period immediately post weaning is crucial for development of fat cells and fat tissue and may be a key period for influencing body fat mass. It seems that a low protein diet in that period may program the animals for increased fat deposition.

Conclusions

- The amino acid level in the nursery diet in week 1 post weaning had little effect on growth performance whereas in week 2-5 the dietary amino acid content drastically improved growth rate and feed utilisation.
- Piglets receiving low amino acid nursery diets showed an improved feed utilisation in later life, suggesting reduced maintenance requirements or a shift in the ratio between lipid and protein deposition.
- An increase in amino acid content in the nursery diet supplied in the first two weeks post weaning significantly reduced the back fat content at slaughter at six months of age. This result suggests that the period immediately post weaning is crucial for development of fat cells and fat tissue and may be a key period for influencing body fat mass