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THE EFFECT OF PREWEANING FEEDING BEHAVIOUR ON THE FEEDING BEHAVIOUR OF TWO GENETIC LINES OF PIGLETS POSTWEANING

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SUMMARY

The objective of the study was to investigate the feeding behaviour for two different genetic lines of piglets one week preweaning and postweaning. A total of 16 piglets from different genetic lines of pigs (LGAH vs. VFIL) were used in this study. The LGAH pigs spent more time on feeding and fed more frequently than VFIL pigs. Conversely, the time spent and bout of suckling was higher for VFIL pigs than LGAH pigs. However, the LGAH pigs had a longer suckling period per bout of suckling than for VFIL pigs. The LGAH pigs had a higher weekly feed intake and liveweight gain than VFIL pigs. However, the final liveweights (weaning weights) were not significantly different between the two lines. Weekly liveweight gain was positively correlated with weekly feed intake. After weaning, the means for duration of feeding per day were not significantly different for the two genetic lines of pigs. However, the LGAH pigs ate more frequently and had a shorter duration of feeding time per bout of feeding than the VFIL pigs. The LGAH pigs had a significantly higher weekly liveweight gain and feed intake than the VFIL pigs. However, there were no line effects on the final liveweight. Weekly liveweight gain was significantly correlated with weekly feed intake. The duration of feeding per day and the number of bouts of feeding per day before weaning were positively correlated in respect to the duration of feeding per day and number of bouts of feeding per day after weaning. The findings indicated that the LGAH pigs better adapted to the new environment due to earlier experience in consuming solid food before weaning. Thus, they had a better growth rate one week before and after weaning than the VFIL pigs.

Keywords: postweaning pig, feeding behaviour, genetic line

INTRODUCTION

Weaning implies the time when offspring are removed from the dam and fed on a solid diet. Weaning of piglet is usually abrupt and stressful. The piglet not only finds itself in new social and environmental conditions but also losses maternal protection, its major source of nutrition and external defences. If the weaned pig is not properly managed, it can have negative impacts on the overall production. Postweaning piglets usually suffer a growth check, which is associated with a temporary reduction in voluntary feed intake, poor energy and nitrogen digestibility (Owsley *et al.*, 1986). Bark *et al.* (1986) suggested that lack of familiarity with the diet in newly weaned pigs is one of the causes that contribute to the poor performance after weaning. There is always a slight liveweight loss or no liveweight change in the first week after weaning. In normal farm practice, creep feed is usually provided to the pre-weaning piglets in order to prepare the piglets for a solid diet postweaning, and thus promote a more successful adjustment to weaning (Fraser *et al.*, 1994). Wangness *et al.*, (1980) have shown that genetic strains of pigs differ in their feeding patterns; obese pigs spend more time at the feeder and have a slower rate of feeding compared with lean pigs.

Graham *et al.* (1981) reported that the performance of post-weaning piglets is influenced by their weight at weaning. Heavier piglets at weaning have greater weight gains postweaning. This indicates that the piglet with heavier weaning weight adapts more rapidly to a cereal grain diet than piglets with lighter weight. However, Loh *et al.* (1998) demonstrated that no relationship was found between weaning weight and feed intake and growth rate during the first week postweaning and general performance. The result suggests that heavier weaned piglets do not necessarily tolerate well the new diet and environment as compared to the lighter ones. These inconsistent results might be due to the variation in the carry-over effect of maternal benefits, particularly the sow milk consumption by the piglets (Hardy, 1992).

Furthermore, there is very little information on the feeding behaviour in relation with the growth performance for different genetic lines of piglets postweaning. The objectives of this study were to study the feeding behaviour for two different genetic lines of piglet, one week preweaning and postweaning.

MATERIALS AND METHODS

Sixteen 3-week-old piglets from two genetic lines of pigs (LGAH vs. VFIL; Cameron and Curran, 1994a and b; Cameron *et al.*, 1994) were used to study their feeding

behaviour pre- and postweaning. Creep feed was given to all the piglets one week before and one week after weaning. The grower diet (code 274) was given from 4 days after weaning. It was mixed with the creep feed and the proportion increased gradually (first day: 75% creep feed and 25% grower feed; second day: 50% creep feed and 50% grower feed; third day: 25% creep feed and 75% grower feed; fourth day: 100% grower feed) to acclimatise piglets to the growing diet.

The pigs were weaned from 28 to 32 days of age. All the piglets were randomly allocated to individual pens and housed in a room with the temperature maintained at 28-30°C. The piglets were allowed to consume the feed and water *ad libitum*. The residual feed was measured on a daily basis. The actual feed intakes were calculated from the subtraction of total feed given and residual feed in the feed trough. The piglets were weighed weekly.

The feeding behaviour was studied using two time-lapse video recorders with two video cameras. The video cameras were mounted on a rail attached to the wall, allowing the camera to be positioned in front of the pens up to 2 metres above the ground. The recording was carried out for 24 hours for one week before and after weaning. The video recorder was programmed with the recording interval at 0.18 second and speed of the tape was 2.599 mm per second. Prior to video recording for one week before weaning the piglets were numbered consecutively using a durable marker spray to ensure easy identification on the video tapes. The markings were still visible for the recording on the following morning.

The video tapes were viewed using the same video recorder, played at 8X real speed. The feeding behaviour was viewed twice for each tape. The mean duration of feeding was calculated every hour from the beginning until the end of feeder visits for each individual piglet. The bout of feeding defined as frequency of feeder visit in a period of time was recorded hourly. The mean duration of feeding and bout of feeding were then calculated for a week before and a week after weaning.

The data were analysed by analysis of variance (ANOVA) using the general linear model (PROC GLM, SAS, 1988). The genetic line, sex,main effects and their interactions were included in the model. A least significant difference (LSD) was used to compare the means.

Table 1: Feeding behaviour and growth parameters of two genetic lines of pigs before weaning

	Parameters	LGAH	VFIL	P
Feeding behaviour:				
	N	8	8	
Feed Intake	Mean feeding time (min)/day	9.36±3.02	0.20±0.05	**
	Mean bout of feeding/day	7.09 ± 2.10	0.34±0.12	**
	Mean feeding time (min)/bout of feeding	1.35±0.08	0.25±0.12	**
Suckling	Mean suckling time (min)/day	133.87±19.75	168.08±21.45	*
	Mean bout of suckling/day	19.43±2.56	30.71±3.56	*
	Mean suckling time (min)/bout of suckling	6.89±0.48	5.47±0.59	*
Growth performance:				
	Initial weight, g	6400±644	6300±248	NS
	Weaning/Final weight, g	8206±745	7229±309	NS
	Weekly liveweight gain, g/week	1806±185	929±173	**
	Weekly feed intake, g/week	288±61	3±1	**

NS, P>0.05; *, P<0.05; **, P<0.01. The results are presented as mean±SEM.

RESULTS

Feeding behaviour and growth performance before weaning

The feeding behaviour and performance results are presented in Table 1. The parameters of feeding behaviour were recorded from the beginning until the end of each feeder visit. The LGAH pigs spent more time on feeding and fed more frequently ($P<0.01$) than VFIL pigs. The mean feeding period per bout of feeding for LGAH pigs was about five times longer than for the VFIL pigs. Conversely, the time spent and bout of suckling was higher ($P<0.05$) for VFIL pigs than LGAH pigs. However, the LGAH pigs had a longer ($P<0.05$) suckling period per bout of suckling than for VFIL pigs.

The pattern of duration of feeding differed between these two genetic lines of pigs (Fig. 1). The VFIL pigs were not interested in the feed provided and never exceeded 5 seconds per hour in feeding. In contrast, the LGAH pigs usually started to eat after suckling between 7 am and 12 pm and 3 pm to 9 pm (Fig. 1). The number of bouts of feeding (Fig. 2) showed a similar pattern to that seen in Fig. 1.

The differences between genetic lines in eating pattern before weaning resulted in a different growth performance between genetic lines as the LGAH pigs had a higher ($P<0.05$, Table 1) weekly feed intake and liveweight gain than VFIL pigs. However, the final liveweights (weaning weights) were not significantly different ($P>0.05$) between the two lines. In the Pearson's correlation test, weekly liveweight gain was positively correlated with weekly feed intake ($R=0.72$, $P<0.01$).

Feeding behaviour and growth performance after weaning

The feeding behaviour and performance results after weaning are presented in Table 2. Feed consumption began after 4-5 hours of placement of LGAH pigs into individual pens, and after 7-8 hours for the VFIL pigs. The means for duration of feeding per day were not significantly different ($P>0.05$) for the two genetic lines of pigs. However, the LGAH pigs ate more frequently and had a shorter duration of feeding time per bout of feeding ($P<0.05$) than the VFIL pigs (Table 2).

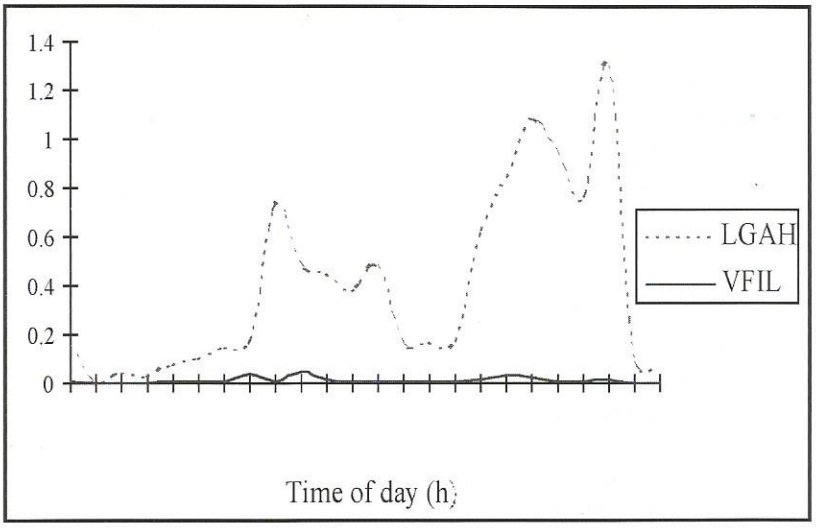

Fig.1. Mean duration of feeding for two different genetic lines of pigs one week before weaning.

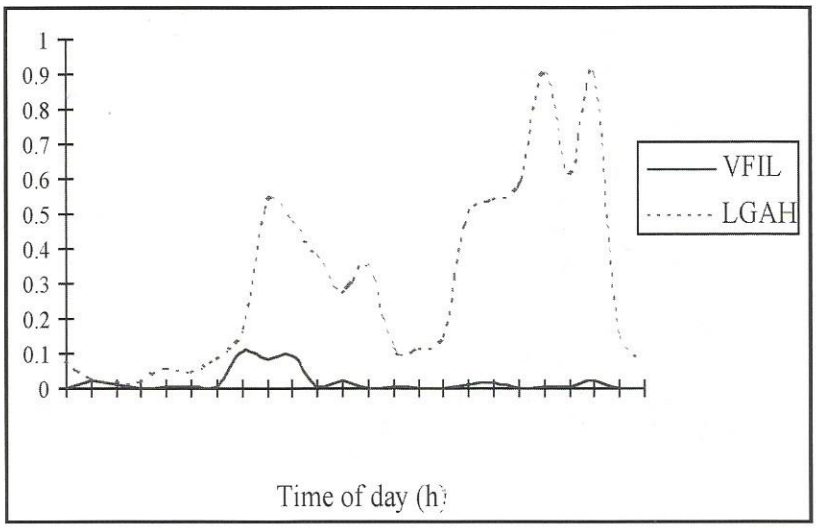

Fig.2. Mean bout of feeding for two different genetic lines of pigs one week before weaning.

Table 2: Feeding behaviour and growth parameters for two genetic lines of pigs postweaning

	Parameters	LGAH	VFIL	*P*
Feeding behaviour:				
	n	8		
	Mean feeding time (min)/day	76.42±4.57	74.68±5.43	NS
Feed Intake	Mean bout of feeding/day	51.30±6.74	36.98±3.46	*
	Mean feeding time (min)/bout of feeding	1.58±0.30	2.13±0.19	*
Growth performance:				
	Initial weight, g	8206±745	7229±309	NS
	Final weight, g	10066±912	8520±335	NS
	Liveweight gain, g/week	1860±214	1290±113	*
	Feed intake, g/week	1982±206	1452±71	*

NS, $P>0.05$; *, $P<0.05$. The results are presented as mean±SEM.

The pattern of time spent and number of bouts of feeding are shown in Figs. 3 and 4, respectively. The LGAH pigs spent the longest time feeding from about 6-7 am (when they were first given food in the morning). In contrast, the VFIL pigs spent the longest period feeding at about 4-5 pm (Fig. 3).

In terms of the number of feeding bouts, LGAH pigs showed a low level of activity at night (Fig. 4), a peak in the morning followed by a decline around midday and afternoon peaks. However, in VFIL pigs, there were several peaks during the day time and a low level of feeding activity during night time.

The LGAH pigs had a significantly higher ($P<0.05$) weekly liveweight gain and feed intake than the VFIL pigs. However, there were no line effects ($P>0.05$) on the final liveweight. Using Pearson's correlation coefficient (Minitab, 1995), weekly liveweight gain was significantly correlated (R=0.91, $P<0.01$) with weekly feed intake.

Relationships of feeding behaviour and growth performance variables between preweaning and postweaning

The duration of feeding per day and the number of bouts of feeding per day before weaning were positively correlated in respect to the duration of feeding per day and number of bouts of feeding per day after weaning (R=0.44, $P<0.05$; R=0.62, $P<0.01$ respectively). These positive correlations were also found in weekly feed intake and liveweight gain before weaning and after weaning (R=0.59, $P<0.01$; R=0.61, $P<0.01$, respectively).

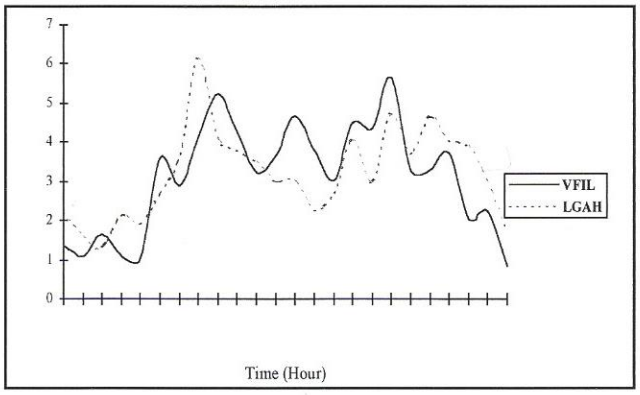

Fig.3. Mean duration of feeding for two different genetic lines of pigs one week after weaning.

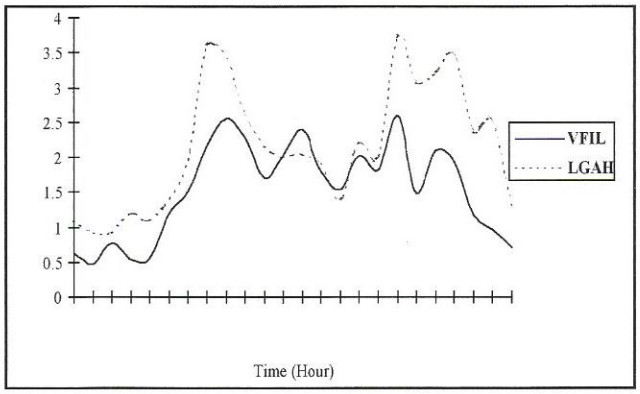

Fig.4. Mean bout of feeding for two different genetic lines of pigs one week after weaning.

DISCUSSION

Feed is usually provided as creep feed to preweaning piglets in order to satisfy their nutritional demands in case of failure to consume sufficient milk from the sow (Okai *et al.*, 1976; Pajor *et al.*, 1991). This work provided basic information on the feeding behaviour and growth performance of piglets one week pre- and post-weaning.

Feeding behaviour and growth performance before weaning

The results of feeding behaviour (Table 1) showed that the LGAH pigs spent more time and visited the feeder more frequently than the VFIL pigs. Additionally, the VFIL pigs had a lower liveweight gain and feed intake than LGAH pigs. These results probably indicate that the LGAH pigs are unable to get adequate milk from the sow. In order to compensate for the loss of nutrients, they have to change the diet somewhat from milk to solid food. However, it may be supposed that the VFIL piglets have sufficient milk from the sow, therefore they are not interested in the solid food provided. Nevertheless, this view needs further investigation on the quality and quantity of milk produced from the sow.

A positive correlation between liveweight gain and feed intake (R=0.72, $P<0.01$) shows that feed consumption plays an important role in growth of preweaning pigs especially as the milk production of the sow declines after 3 weeks of lactation (Whittemore, 1993). Pajor *et al.* (1991) reported that there was a direct contribution of creep feed intake to weight gain during the preweaning period.

Feeding behaviour and growth performance after weaning

Weaning is a stressful event and involves a number of changes, for example the source of nutrition is changed and the social bonds to the sow are broken (Algers *et al.*, 1990). The results of feeding behaviour (Table 2) indicate that the LGAH pigs had a greater mean bout of feeding with a shorter duration of each feeding bout and achieved a higher feed intake than the VFIL pigs. This shows that different amounts of feed had been eaten at each time of eating in thetwo lines of pigs. De Haer and Merks (1992) compared individually housed pigs to group housed animals and found that pigs kept individually had more frequent, but shorter visits to the feeder, and ate less per visit than pigs kept in groups of eight.

In the new environment (individually penned), the LGAH pigs began to consume the feed at a rate comparable to the VFIL pigs. This appears to be a measurement of the successful adaptation to the new environment. The results of measurements of feeding duration (Table 2) support the earlier hypothesis that the piglets with greater growth rate have a better adaptation to the new environment. However, we must reject the hypothesis that piglets with a greater growth rate have a longer feeding time.

The duration of feeding per day for both lines of pigs was similar (Table 2) and could perhaps be explained by the VFIL pigs' lack of experience with solid food; therefore they required a longer time to chew and swallow the food. However, the LGAH pigs had more experience with eating solid food before weaning, hence the bouts of feeding were higher after weaning.

The pattern of bout of feeding for LGAH and VFIL pigs can be characterised by several peaks in day time and a low level at night (Fig. 4). However, de Haer and Merks (1992) reported that the pattern of daily feed intake can be characterised by two peaks: a relatively smaller peak in the morning compared with a large peak in the beginning of the afternoon.

Relationships of feeding behaviour and growth performance variables between preweaning and postweaning

Positive correlations of the duration of feeding per day, number of bouts of feeding per day and weekly feed intake before and after weaning (R=0.44, R=0.62, R=0.59, $P<0.01$, respectively), indicate the importance of food provision before weaning. This is because it has a major impact on the feed consumption after weaning. Exposureto solid food before weaning provides nutrition especially to the piglets which are unable to get sufficient milk from the sow. In addition, piglets exposed to solid food before weaning may have enabled them to adapt to the new environment sooner. This is in agreement with reports by other workers (Pajor *et al.*, 1991; Appleby *et al.*, 1991, 1992). Piglets that gained more weight in the week before weaning continued to gain better in the post-weaning period as reported by Aherne *et al.* (1982).

CONCLUSIONS

It is important to provide solid food to the piglets before weaning. The LGAH pigs had a better adaptation to the new environment due to earlier experience in consuming solid food before weaning. As a result, the LGAH pigs had a better growth rate one week before and after weaning than the VFIL pigs. The piglets with a greater growth rate do not necessarily have a longer feeding time.

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RINGKASAN

KESAN KELAKUAN PEMAKANAN SEBELUM PENYAPIHAN TERHADAP KELAKUAN PEMAKANAN DUA GENETIK ANAK BABI SELEPAS PENYAPIHAN

Okjektif kajian ini ialah untuk menyiasat kelakuan pemakanan untuk dua jenis genetik anak babi satu minggu sebelum dan selepas penyapihan. Sejumlah enam belas ekor anak babi yang berumur 3 minggu dari dua jenis genetic yang berlainan digunakan untuk kajian ini. Babi LGAH membelanjakan lebih masa untuk memakan dan lebih kerap lagi daripada babi VFIL. Walaubagaimanapun, babi LGAH menghisap susu lebih lama setiap jangkamasa daripada babi VFIL. Babi LGAH mempunyai pemakanan mingguan dan tambahan berat hidup yang lebih tinggi daripda babi VFIL. Berat akhir (berat penyapihan) adalah tidak berbeza antara satu sama lain. Tambahan berat hidup mingguan berkorelasi positif dengan pemakanan mingguan. Lepas penyapihan, purata jangkamasa pemakanan harian adalah tidak berbeza untuk dua genetik babi ini. Walaubagaimanapun, babi LGAH memakan lebih kerap dan jangkamasa yang pendek berbanding dengan babi VFIL. Tiada kesan terhadap berat hidup akhir. Tambahan berat hidup mingguan adalah berkorelasi dengan positif dengan pemakanan mingguan. Jangkamasa pemakanan harian dan bilangan pemakanan setiap hari sebelum penyapihan adalah berkorelasi positif dengan bilangan pemakanan setiap hari selepas penyapihan. Hasial kajian ini boleh disimpulkan bahawa babi LGAH mempunyai penyesuaian kepada persekitaran baru yang lebih cepat disebabkan pengalaman yang awal memakan makanan pejal sebelum penyapihan, jadi mereka mempunyai pertumbuhan yang lebih baik sebelum dan selepas penyapihan daripada babi VFIL.