CORRELATION BETWEEN PIG PERFORMANCE IN ELECTRONIC FEEDERS (*AD LIB* FEEDING) AND COMMERCIAL PENS (RESTRICTIVE FEEDING)

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SUMMARY

A total of 184 Large White pigs were used to compare performance in pens with electronic feeders (*ad lib* feeding) with performance in commercial pens (restrictive feeding). The animals were allocated to the two treatments by using split-litter technique. Correlations between performance in the two systems were calculated. The correlation was high for lean percentage (0.81), but lower for LTGR (0.66) and growth rate (0.53).

Keywords: Performance testing, feeding regime, electronic feeders, correlation

INTRODUCTION

Electronic feeders, with which individual feed intake can be recorded on group-housed animals, are commonly used in pig testing today. Although the environment provided during such a test differs substantially from commercial production conditions, it has been assumed that animal performance, and ranking between animals, does not differ between systems. To determine whether this assumption is valid, a small experiment was performed in which the performance of restrictively fed pigs in commercial pens was compared with performance in pens with electronic feeders.

MATERIAL AND METHODS

A total of 184 Large White gilts, barrows and boars (35 litters from 15 sires) were used in this experiment. Split-litter technique was used to allocate the pigs to the two treatments, i.e. commercial feeding and electronic feeders. We tested 128 animals in pens with electronic feeders and 56 in commercial pens. Both pen types were situated in the same stable, and the same feed was used in the two testing systems. Two performance-test diets were used: 50 animals received diet A (12.1 MJ/kg, 12.0% CP, 6.4 g lysine/kg), and 134 received diet B (12.6 MJ/kg, 15.5% CP, 10 g lysine/kg). During the experiment, the animals were kept in pens with 10 animals per pen and the sexes in separate pens.

Feeding in the commercial system was restricted. This feeding regime is commonly used for commercial pig production in Sweden. Allowances were based on mean live weight in pen. The daily dietary feed allowances, in MJ of ME, were 19.0, 24.4, 29.0 and 34.1 MJ at 30, 40, 50, and 60 kg live weight and above, respectively. Animals were fed twice a day. The electronic feeders used were FIRE (Hunday Electronics Ltd), with one feeding station per pen. The feeders offered feed *ad lib*.

The performance test started at 26.4 kg (s.d. = 4.6 kg) and ended the week after the pig reached 90 kg. Ultrasonic measurements were taken at the end of the performance test. Lean percent at 90 kg and LTGR (lean tissue growth rate) were predicted according to Stern *et al.* (1993).

The statistical analysis was performed using the SAS statistical package (SAS Inst. Inc., 1996). Least-square means for the performance traits lean percentage, growth rate during test and LTGR were calculated for each dam-offspring group and system. The statistical model included the effects of diet (A, B), feeding regime (electronic feeders, commercial), sex (gilt, boar, castrate), dam (34 levels) and dam x feeding regime. Spearman correlations between least-square means, within dam were then calculated. Correlations between performance traits in the two systems were calculated based on individual values within each system.

RESULTS

Animals tested with the electronic feeders had a higher growth rate and lower lean percentage compared with those in the commercial feeding system (Table 1). However LTGR was higher for pigs in pens with the electronic feeders. Standard deviations for overall means for all three production traits were larger for the pigs in the electronic-feeder pens than for those in the commercial pens (daily gain, 98 vs 135 g/day; lean percentage 2.49 vs 3.41 and LTGR 70 vs 88 g/day).

Table 1. Least-square means for performance traits of pigs tested in commercial pens and in pens with electronic feeders (commercial N= 56; electronic feeders N=128)

Trait	Commercial feeding	Electronic feeders	Level of significance of difference
Weight at start of test, kg	27.8	27.4	n.s.
Age at start of test, days	78.8	78.8	n.s.
Weight at end of test, kg	92.6	92.5	n.s.
Age at end of test, days	157.7	150.5	***
Daily gain during test, g/day	836	938	***
Lean percentage at 90 kg, %	60.1	58.4	***
Back fat, (P2), mm	13.4	16.3	***
LTGR during test, g/day	505	548	***

Statistical significance: ***:$p < 0.001$; **:$p < 0.01$; *:$p < 0.05$; n.s.: $p > 0.05$

Table 2 shows that lean percent estimated in the two environments has a high correlation. Growth rate measured in the two environments showed a lower correlation, whereas the correlation for LTGR in the two systems was intermediate.

Table 2. Spearman correlations, with level of significance, between measurements taken in the two environments based on least-square means by dam and testing system. Based on information on 22 dams having progenies in both systems

	Lean percentage	Growth rate	LTGR
Lean percentage	0.81***		
Growth rate		0.53**	
LTGR			0.66***

Statistical significance: ***:$p < 0.001$; **:$p < 0.01$; *:$p < 0.05$; n.s.: $p > 0.05$

Table 3. Overall correlations, with level of significance, for the performance traits growth rate, lean percentage and LTGR. Correlations were calculated within each system (Commercial N= 56; electronic feeders N=128)

Correlation between	Commercial	Electronic feeders
Lean percent - Growth rate	0.28 *	0.03 n.s.
Lean percent - LTGR	0.55***	0.41***
Growth rate - LTGR	0.95***	0.92***

Statistical significance: ***:$p < 0.001$; **p:< 0.01; *p: < 0.05; n.s.: $p > 0.05$

Correlations among the production traits (table 3) were lower in electronic feeders than in the commercial pens. Lean percent was favourably correlated to growth rate in the commercial system but the two traits were not correlated in the electronic-feeding system. The correlation between growth and LTGR was very high in both systems.

DISCUSSION

Since this data set is limited in size, no genetic analysis could be made. Therefore, only phenotypic correlations and means are presented here. Furthermore, the between-system correlations were based on a low number (22) of dams; thus, the results need to be interpreted with caution. However, the data indicated that the two systems differ in terms of both absolute values and the magnitudes of the correlations.

All three traits showed larger phenotypic variation in the electronic-feeder system. However, the response to selection will vary depending on the heritabilities and genetic correlations between the traits. Genetic correlations have been shown to differ between *ad lib* and restrictive feeding regimes (McPhee *et al.*, 1988; Gu *et al.* 1989; Cameron *et al.*, 1994). The feeding regime associated with the electronic feeders differs from both these feeding regimes which could be expected to influence the genetic correlations achieved.

From a biological point of view, the systems differ substantially. In the commercial feeding system, animals are fed as a group, and competition between animals influences the animals' individual consumption. The feeding station only allows one pig at the time to eat. This constraint in consumption associated with electronic feeders, compared with *ad lib* feeding, has not been estimated, but De Haer and Merks (1992) found that feed intake in electronic feeders was 8 percent lower for group-housed pigs than for individually penned ones. This indicates that both treatments were somewhat restricted. The feed intake (at 90 kg) in this study was approximately 8 percent higher in the electronic feeders than in the commercial pens.

One argument for introducing electronic feeders was concern over the decrease in appetite. Appetite/feed intake was not included in the present analyses, but Von Felde *et al.* (1996) showed in a study with electronic feeders that LTGR and daily feed intake were positively genetically correlated. The phenotypic correlations between LTGR, growth rate and lean content was of the same magnitude as in this study. Still, correlations estimated in different environments should be compared with caution since they can be affected by the diet used (Stern, 1994).

Lean percentage, being a highly heritable trait, showed a high correlation between systems. Thus lean percentage will only be slightly influenced by the testing environment. The ranking according to growth rate and LTGR, on the other hand, differed more between systems. This indicates two things: first, that the two systems will select for different animals, and second, that the correlated responses are likely to differ between systems, thus affecting the genetic progress achieved. To fully utilise the electronic feeders in breeding systems, further investigations and analyses of genetic correlations between production traits measured in electronic feeders and those measured in commercial production are needed.

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