

Genes for growth rate are expressed differently on restricted and *ad libitum* feeding regimens

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KEYPOINTS: Different genes affect the growth rate of pigs on different levels of feeding. Selection for growth rate on restricted feeding will emphasise food conversion efficiency genes but selection on *ad libitum* feeding will emphasise appetite genes. This means that pigs selected for growth rate on restricted feeding will not all be the same pigs as those selected for growth rate on *ad libitum* feeding.

Often the selection of pig breeding stock is carried out under conditions of nutrition and management which differ from those under which production is carried out. Thus the genetic changes brought about in the selection environment may not be exactly reproduced in the production systems. Restricted feeding has been proposed as the most suitable environment for the selection of breeding stock whose descendants are grown on both restricted and *ad libitum* feeding (Clutter and Brascamp 1998). The hypothesis tested here was that growth rates on restricted and *ad libitum* feeding are two different traits and regulated by two different sets of genes. It was tested by estimating the genetic correlation between the same trait in different feeding environments.

The study reports estimates of the genetic correlations of the same performance traits (growth rate and fat) tested on both feeding regimens in Large White pigs undergoing selection for body weight gain. These results are useful for designing management systems for genetic selection and evaluation programs.

In brief, pigs were sampled across litters from the lines at 50 kg body weight, and individually fed either a grower diet restricted to approximately 80% of average *ad libitum* intake or *ad libitum* over a six- week period. All animals were fed a diet containing 14 MJ DE and 0.65g/MJ available lysine. Live weight and ultrasonic backfat thickness at P₂ were measured at the end of the test.

Genetic correlations for the same traits measured on the two feeding regimens were

estimated using a restricted maximum likelihood analysis of multivariate models fitting batch and sex as fixed effects, and the individual animal as a random effect (Gilmour et al. 1999).

Figure 1. Genetic correlations for the same traits measured on restricted and *ad libitum* feeding

Estimated correlations were 0.16 for average daily gain (ADG) and 0.67 for P₂- fat (see Figure 1). These values are both less than one, markedly so for growth rate. This indicates that the genes that affect these traits, particularly growth rate, on restricted feeding tend to be different from the genes that affect them on *ad libitum* feeding.

One outcome of this is that performance testing for growth rate on restricted feeding will lead to the selection of some animals which would not have been selected had *ad libitum* feeding been used.

Keywords: Selection, pigs, genotype, environment, interaction, restricted, *ad libitum*.

References

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