IGF-1 Concentration at a Young Age is Associated with Feed Efficiency in Pigs

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Summary and Implications

The concentration of IGF-I in blood of young pigs has previously been found to be genetically associated with feed efficiency and performance in pigs. To test these associations, data from the ISU selection line for residual feed intake (RFI) were used. Compared to controls, in the line selected for increased efficiency through reduced RFI, a correlated response in the expected downwards direction was observed for juvenile IGF-I. Genetic correlations of IGF-I were 0.63 with RFI and 0.78 with feed conversion ratio. These results confirm that juvenile IGF-I is a good physiological indicator of genetic merit for economically important efficiency traits, particularly since it is measured early in an animal's life.

Introduction

Previous studies have suggested that the concentration of insulin-like growth factor-I (IGF-I) in blood, measured at an early age, can provide information on the genetic merit of individuals for efficiency and some related production traits. Thus, IGF-I is potentially an informative selection criterion in breeding programs that target improved efficiency. The purpose of this study was to use confirm these results in the ISU selection line for residual feed intake (RFI), a measure of feed efficiency, by determining whether selection for RFI has resulted in correlated responses in IGF-I. Genetic correlations of IGF-I with RFI and other performance traits were estimated also.

Materials and Methods

Performance and feed intake data from the first five generations of the ISU selection experiment for RFI in Yorkshire pigs were used. This experiment consists of a line selected solely for reduced RFI (increased efficiency) and a randomly selected control line. Testing for IGF-I commenced in generation two. Blood samples collected post-weaning, between 35 and 42 days of age, were transferred to a bloodspot card and analysed by Primegro Technologies (Australia) using Primegro IGF, a commercially available ELISA assay (Diagnostic Systems Laboratories Inc., Webster, TX).

Estimates of genetic parameters and breeding values (EBVs) were obtained under an animal model using ASREML (Gilmour et al., 1999). Univariate analyses were used to derive fixed effects models and to estimate heritabilities. Genetic correlations between traits were estimated from bivariate analyses. Line differences were calculated as the difference in average EBV between lines by generation.

Results and Discussion

The heritability of IGF-I was 0.28±0.06 and genetic correlations of IGF-I with feed intake (0.26±0.17), back fat (0.52±0.11) and feed conversion ratio (0.78±0.14) were moderate to large. The estimated and realised genetic correlations between RFI and IGF-I were 0.63±0.15 and 0.84. In contrast, genetic correlations between IGF-I and lifetime or test period growth did not significantly differ from zero (0.06±0.14 and -0.19±0.14). Selection for lower RFI produced a direct response in RFI, as expected, and was accompanied by downward correlated responses in average daily feed intake, juvenile IGF-I, back fat and growth traits, listed in order of decreasing relative magnitude, and an increased loin muscle area (Figure 1). The correlated response in IGF-I to selection on RFI demonstrates that this physiological measure is genetically associated with efficiency, and is thus useful as an early information source to estimate genetic merit for efficiency prior to performance testing. Lower juvenile IGF-I is associated with leaner, more efficient animals.

Acknowledgments

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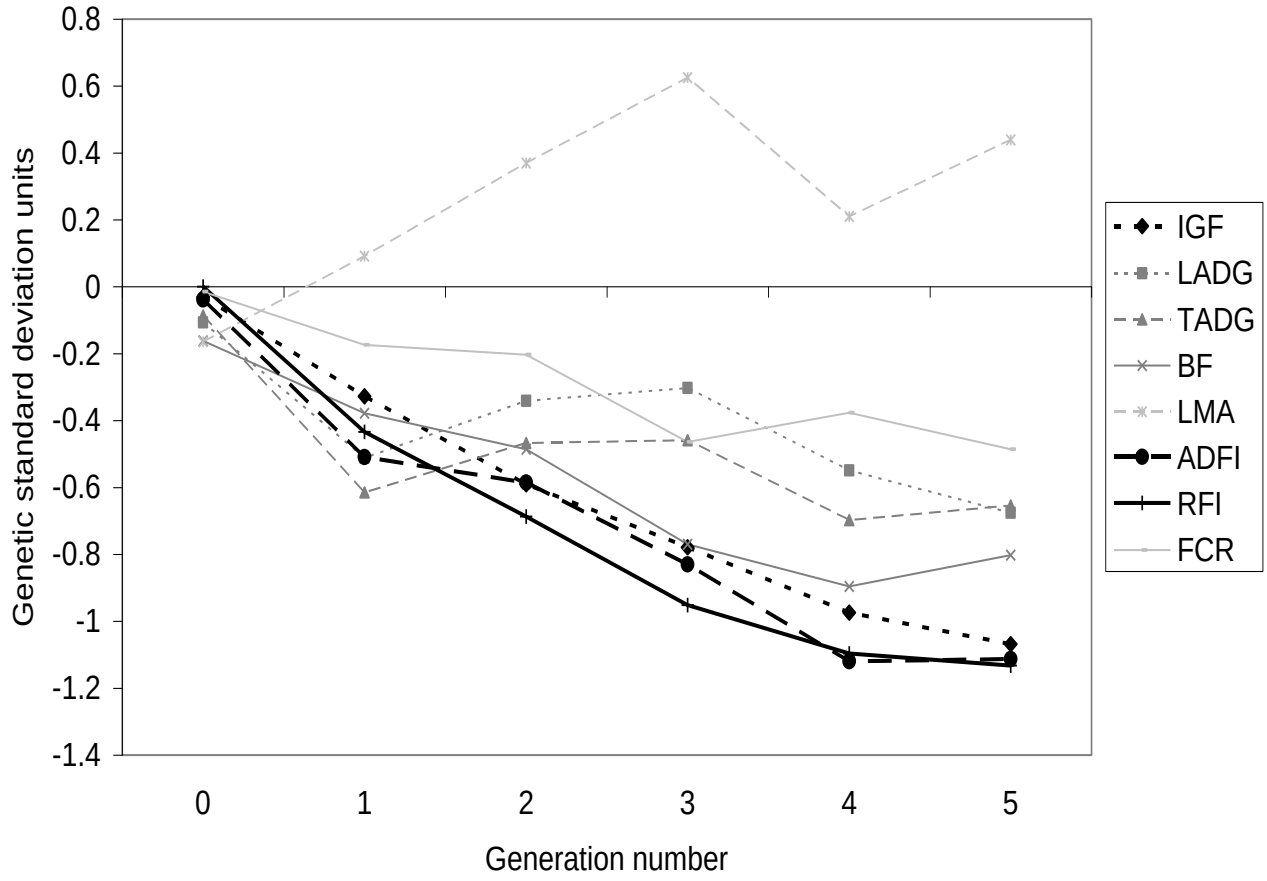

Figure 1. The difference between the mean EBV for Select and Control lines for each trait (expressed in genetic standard deviations for each trait).
IGF-I: insulin like growth factor-I; LADG: lifetime average daily gain; TADG: test average daily gain; BF: back fat; LMA: loin muscle area; ADFI: average daily feed intake; RFI: residual feed intake; FCR: feed conversion ratio.