

RESPONSE TO SELECTION FOR AVERAGE DAILY GAIN AMONG BOARS WITH LIMITED FEED INTAKE

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Story in Brief

Selection for fast gain under an environment of limited feed intake is hypothesized to favor animals that partition the allotted energy to lean rather than fat, thus improving lean tissue feed conversion. The following lines were derived from a composite population of pigs that had previously been selected for gain at ad libitum intake: 1) continued selection for postweaning average daily gain (ADG) among boars allowed ad libitum access to feed (F); 2) selection for postweaning ADG among boars limited to 83% of predicted ad libitum (L); and 3) an unselected control (C). Postweaning performance of barrow and gilt progeny, allowed ad libitum feed intake, was evaluated after five generations of selection. Barrows and gilts from F gained faster than those from C and L during the postweaning period. However, L pigs had less backfat and greater feed efficiency than those from C or F. Although selection in L was designed to be independent of intake variation, ad libitum feed intake of L was decreased relative to that of C and F. Selection for ADG under limited feed intake has changed body composition and feed efficiency, but put downward pressure on ad libitum feed intake. A selection method that improves the efficiency of lean tissue deposition without decreasing appetite would be more desirable.

(Key Words: Swine, Efficiency, Lean Gain, Selection.)

Introduction

Selection on a simple index of ADG and average backfat thickness has been effective as a method to improve the rate and composition of gain (Cleveland et al., 1983). Fowler et al. (1976) suggested that an appropriate selection objective was lean tissue feed conversion and proposed ADG under scale feeding as a selection criterion. If animals are allowed a standard daily

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intake relative to their body size, those that grow the fastest are those that partition the available energy to lean versus fat. Selection under an environment in which variation in feed intake is removed should also avoid the downward pressure on feed intake that may occur with index selection for efficient lean gain.

McPhee and Trappett (1987) used the mouse as a model to compare selection for ADG under ad libitum versus limited intake. After six generations of selection, the lines were evaluated at both feeding levels. The line selected for ADG under limited intake expressed the greatest lean tissue feed conversion regardless of the feeding level at which the lines were compared.

A study was initiated in 1985 at the Oklahoma State University Swine Breeding Facility located at Fort Reno to compare selection for ADG at ad libitum versus limited intake in the pig. The objective was to determine if selection for ADG with limited intake is an effective way to improve lean tissue feed conversion without putting downward pressure on feed intake.

Materials and Methods

Three sublines were derived from a crossbred composite population previously selected for postweaning ADG at ad libitum intake (see Woltmann et al., 1992 for a description of the previous selection). The sublines derived for the present study were: 1) continued selection for postweaning ADG among boars allowed ad libitum access to feed (F); 2) selection for postweaning ADG among boars limited to 83% of predicted ad libitum (L); and 3) an unselected control (C). The level of feed restriction in L is designed to standardize intake per unit of body weight, but not restrict expression of lean growth. The lines were represented in each of two farrowing groups and lines within each group were maintained with 25 females and 6 males per generation.

Thirty-six boars each from F, L and C were left intact each generation as potential replacement breeders. Consequently, the top 16.7% (6/36) were selected in F and L each generation. Boars from F and C were penned by line in groups of 12 and allowed ad libitum access to feed. Boars from L were individually fed to allow limited intake. The barrow and gilt progeny from each line were penned by line in groups of 16 to 18 and allowed ad libitum feed intake. There was no intentional selection on gilt replacements.

Postweaning performance characteristics of barrow and gilt progeny from these lines were analyzed following five generations of selection. Average daily gain from 9 wk of age to 220 lb and average backfat thickness (mode A ultra-sound) adjusted to 230 lb were recorded for each individual. Ad libitum daily feed intakes were measured on a pen basis. Individual performance data were analyzed using a model that included the effects of line, farrowing group, sex and all interactions. Pen data were analyzed using the same model, excluding the effects of sex.

Results and Discussion

A summary of response in postweaning performance after five generations of selection is presented in Table 1. The means presented are for barrow and gilt progeny allowed ad libitum access to feed. Barrows and gilts from F gained faster ($P < .01$) than those from C and L during the postweaning period. However, L pigs had less backfat and greater feed efficiency ($P < .05$) than those from C or F. Ad libitum feed intake of L was decreased ($P < .05$) relative to that of C and F. Response in these performance traits indicate that selection for ADG among barrows with limited feed intake has changed body composition and the efficiency of gain in their progeny that are allowed ad libitum intake. Although selection in L is designed to be independent of intake variation, this method of selection appears to have had downward pressure on ad libitum intake. A selection method that improves the efficiency of lean tissue deposition without decreasing appetite would be more desirable.

An evaluation has been initiated in which barrows from each of the lines are individually fed and assigned either limited or ad libitum access to feed. Collection of complete carcass data at 230 lb will allow measurement of responses in lean growth rate and lean tissue feed conversion.

Table 1. Postweaning^a performance of Generation Five F, L and C^b barrows and gilts.

Line	n	ADG, lb	ADJBF ^c , in	ADFI, lb	Feed:Gain
F	224	2.00 (.02) ^d	1.34 (.01)	6.23 (.13)	3.08 (.02)
L	261	1.89 (.02)	1.29 (.01)	5.61 (.13)	3.00 (.02)
C	276	1.94 (.02)	1.33 (.01)	5.85 (.13)	3.07 (.02)

^a 9 wk to 220 lb.

^b F=selection for postweaning ADG at ad libitum intake; L=selection for postweaning ADG at 83% predicted ad libitum; C=unselected control.

^c Average of first rib, last rib and last lumbar adjusted to 230 lb.

^d Standard errors in parentheses.

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Table 1. Performance characteristics of Duroc and Landrace pigs.

Line	ADG (g)	ADG (lb)	ADG (kg)	Feed/Gain
1	204	4.59 (0.10)	1.94 (0.02)	3.08 (0.03)
2	261	5.81 (0.15)	2.61 (0.03)	3.01 (0.03)
3	274	6.04 (0.15)	2.72 (0.03)	3.07 (0.03)

^a n = 200 pigs

^b Feed restriction for postweaning ADG at 20 lb from intake restriction for postweaning ADG at 100 lb (based on 100 lb) Control group.

^c Average of fast and slow gain lines adjusted to 200 lb.

^d Standard error in parentheses.