Optimal Dietary Energy and Protein for Gilt Development: Age at Puberty, Ovulation Rate, and Reproductive Tract Traits

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Summary and Implications

The effect of feeding different lysine and metabolizable energy (ME) levels to 1221 crossbred Large White × Landrace developing gilts housed in groups from 100 d of age until slaughter (approximately 260 d of age) on age at puberty and reproductive tract measurements were evaluated. Gilts were randomly allotted to six corn-soybean diets formulated to provide two standardized ileal digestible lysine levels [100% (high, HL) and 85% (low, LL)] and threemetabolizable energy levels [ME, 90% (low, LME), 100% (medium, MME), 110% (high, HME). Average age at puberty was 193 d of age. There were no effects of the dietary treatments on age at puberty or any of the reproductive tract measurements. Despite significant differences in the lysine:energy ratio in the diets, the expected differences in reproductive traits were not observed. Other factors such as body weight (BW) and days of estrous cycle had a greater effect on the traits recorded than feed provided.

Introduction

Adequate nutrition during growth is required for proper development of reproductive females and energy and protein intake can influence reproductive performance of gilts as growth rate and body composition are related to age at puberty. Studies about the effect of different lysine and energy levels in the diet on age at puberty and reproductive tract measurements are scarce; in fact, most of the studies focus on different dietary regimes (i.e. *ad libitum* vs. restricted feeding) and their effects on reproductive performance and sow longevity. Therefore, the objective of this study was to determine the effect of feeding diets differing in lysine and metabolizable energy to developing gilts on age at puberty onset and reproductive tract development.

Materials and Methods

Crossbred Large White × Landrace gilts (n = 1221) housed in groups from 100 d of age until slaughter (approximately 260 d of age) and randomly allotted to six corn-soybean diets formulated to two standardized ileal digestible lysine levels [100% (high, HL) and 85% (low, LL)] and three metabolizable energy levels [ME, 90% (low, LME), 100% (medium, MME), 110% (high, HME)were used in this study. The 100% ME, 100% lysine control diet was based on an average from an informal survey conducted by the National Pork Board to provide a consensus dietary lysine and ME content for gilt development diets commonly utilized by the U.S. swine industry. Gilts were weighed and backfat thickness and loin muscle area were recorded at the beginning of the trial and then every 28 d. Starting at 160 d of age, gilts were exposed daily to vasectomized boars and observed for signs of standing estrus. At approximately 260 d of age, gilts were slaughtered and their reproductive tract was collected. Each reproductive tract was examined to determine whether the gilt was cyclic, stage of estrous cycle, ovulation rate, uterine length and ovary length and width. Data were analyzed using mixed model equation methods (SAS v9.4 PROC MIXED; SAS Inst. Inc., Cary, NC).

Results and Discussion

Average age at puberty was 193 d of age with a range from 160 to 265 d. There was no difference in age at puberty among dietary treatments($P > 0.05$). A number of factors such as age, BW, backfat thickness and boar exposure affect the onset of puberty in the gilt. Studies have suggested that gilts need a minimum BW and a minimum level of backfat to attain puberty, and there were no differences in backfat thickness and BW between treatments in this experiment, which could partly explain the lack of differences in age at puberty.

Approximately 6% of gilts were not observed in standing estrous between 160 and 260 d of age; however, only 4% of gilts had not attained puberty when evaluated at slaughter, determined by the absence of *corpora lutea* or

corpora albicantia. The remaining gilts with no observed standing estrus was assumed to be behaviorally anestrus (cycling but no signs of standing estrus observed). At slaughter, there were more pre-pubertal gilts (i.e. gilts that did not attain puberty) in the low lysine treatment when compared with high lysine treatments (33 vs. 16 gilts, respectively), thus low protein in the diet was associated with puberty failure. There were no differences between dietary treatment for ovulation rate, uterine length and ovary length and width. Uterine length in this experiment varied with stage of the cycle and was greater as gilt body weight increased.

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