

Title: Optimal dietary energy and protein for the development of gilts - NPB #12-209

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Scientific abstract

The main objective of this study was to determine three diets for use in a NPB primary trial of dietary effects on gilt development and retention of sows in the breeding herd to fourth parity. A second objective was to examine the influence of litter of origin traits on gilt development. At birth, gilts were weighed, a blood sample was collected for immunocrit measurement, and litter details (born alive, stillborn, mummies) were recorded. Gilt weights were also recorded at weaning. One-thousand-two-hundred-and-twenty-one crossbred Large White × Landrace gilts housed in groups of 17 to 18 were randomly allotted to one of 6 corn-soybean diets formulated using a 2 × 3 factorial arrangement that provided 2 levels of standardized ileal digestible (SID) lysine [100% (high, HL) and 85% (low, LL); the latter designed to restrict protein deposition] and 3 levels of metabolizable energy [ME; 85% (low, LME), 100% (medium, MME), 115% (high, HME)] at 100 d of age. Gilts were weighed and back fat thickness and loin area muscle were recorded every 28 d beginning when diets were applied. Fat free lean meat content was also calculated for every 28 d period. Feed intake was recorded as feed disappearance within the pen at 2 week intervals. Grams of lysine and Mcal consumed for every 2 week period and grams of lysine and Mcal consumed daily were calculated based on diet formulation on a pen basis. Average daily gain, feed, lysine and ME intake per kg of BW gain were also calculated. Starting at 160 d of age, gilts were exposed daily to vasectomized boars and observed for behavioral estrous. At approximately 260 d of age, gilts were slaughtered and their reproductive tract was collected. Whether the gilt was cycling, stage of cycle, ovulation rate,

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uterine length and ovary length and width were recorded. Warm and chilled carcass weight and carcass fat thickness were also recorded. Fat free lean meat content and dressing percentage were calculated. Data were tested for normality and analyzed using mixed model equation methods. The interaction between lysine level and ME levels was not a significant source of variation for growth and body composition traits ($P > 0.05$). In addition, There were no main effects of lysine levels or ME levels for growth or body composition traits, except for back fat thickness which was slightly higher for gilts fed a HME diet, although this result is biologically questionable because the magnitude of the difference was small. Gilts fed the LL diet had a lower lysine intake compared with gilts fed the HL diet ($P < 0.05$). Gilts fed HME diets had a lower feed intake but a higher ME intake compared with gilts fed LME or MME diets ($P < 0.05$). Additionally, gilts fed the HME had lower feed and lysine intake per kg of BW compared with gilts fed LME or MME diets ($P < 0.05$). However, there was no difference in the Mcal consumed per kg of BW among treatments ($P > 0.05$). There were no differences among treatments in age at puberty or any of the reproductive tract measurements ($P > 0.05$). Carcasses from gilts fed the HME diet were 3.3 kg and 2.5 kg heavier than those from gilts fed the LME or MME diets ($P < 0.05$). Additionally, carcasses from gilts fed the HME diet had a higher dressing percentage than carcasses from gilts fed the LME or MME diets ($P < 0.05$). Despite significant differences in the ratio of lysine and energy in the diets, no changes in growth or reproductive traits occurred, likely due to compensatory feed intake in response to the energy content of the diet. Caloric efficiency (Mcal to deposit 1 kg of BW) was similar among treatments. The higher carcass weight and dressing percentage of gilts fed the HME diets is likely related to their lower feed intake and possible reduced organ weight compared with gilts fed LME or MME diets. Further research is required to identify the optimal lysine-to-energy ratio to manipulate growth and body composition in order to reduce age at puberty and improve lifetime reproductive performance and longevity in replacement gilts fed *ad libitum*