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Summary and Implications

An experiment is being conducted on commercial swine operations to determine if plasma urea concentration can be used as an indicator of protein status in growing-finishing pigs. Swine producers in Eastern Nebraska are being selected to participate in this on-farm study. The experiment includes the completion of a 30-question survey and an on-farm visit for the collection of blood and feed samples. The survey includes questions about genetics, nutrition, housing and health. Preliminary results suggest that crude protein is overfed in most finishing diets. Gilts consistently have lower plasma urea concentrations than barrows when gilts and barrows are fed the same diet during the finishing growth period. This confirms the concept that gilts utilize protein more efficiently for lean growth. These results suggest that within an individual swine operation, plasma urea is a useful indicator of protein status in growing-finishing pigs.

Introduction

Because feed costs represent over one-half of production costs from weaning to market, producers must accurately formulate diets to meet the requirements of their pigs to minimize feed costs. Therefore, producers must continually update their swine feeding program and may need to adopt new techniques to improve the accuracy of determining nutrient requirements.

Adopting new methods to improve the estimation of protein requirements for pigs is important for several reasons. First, with the emergence of different commercial populations of pigs, protein requirements for each of these populations will be different because of differences in lean growth potential. Second, dietary protein concentrations must be formulated to maximize lean growth without providing excesses or deficiencies of amino acids that may decrease performance and/or increase production costs. Finally, each operation will have different protein requirements regardless of the genetic population of pigs due to differences in management practices, diseases (clinical and subclinical) and facilities. Because it is too expensive and time consuming for each operation to perform traditional feeding and carcass analysis experiments, a simple on-farm procedure to identify protein requirements for growing-finishing pigs is needed.

Plasma urea has been chosen as a potential indicator of protein status because urea is produced for removal of nitrogen from the body when excess amino acids are metabolized. Increased plasma urea concentrations may be due to an over consumption of protein by the pig, which would indicate an excess concentration of dietary crude protein. An experiment conducted in 1995 at UNL showed that the protein requirements of two populations of pigs in a research setting could be determined using plasma urea concentration. In the aforementioned experiment, low lean gain potential and modern Hampshire pigs with a medium to high lean gain potential were used. Based on the positive results of that experiment, the current experiment was designed to investigate whether plasma urea concentrations can be used as an on-farm index of the protein requirements of different populations of pigs.

Procedures

The experiment includes two parts. Part one is a 30-question survey completed by the producer. The survey includes four major sections with questions about genetics, nutrition, housing and health. The genetic section asks questions about seedstock suppliers, replacement gilts, determination of nutrient requirements and lean gain potential. This section also inquires about slaughter kill sheet data and production records. Information acquired includes backfat depth, loin depth, percent yield, percent lean, hot carcass weight, average weight at the beginning of the growing-finishing period, average slaughter weight, and days from start of the growing-finishing period to slaughter. Nutrition questions include protein and lysine concentrations fed in each diet, the amount of each diet provided, separate-sex feeding and type and amount of antibiotics used in the diets. The housing section questions pertain to type of facilities (confinement or outdoors), ventilation, space/pig, type of feeders and space/pig for feeders and waterers. The health section includes questions about facility biosecurity, pig flow, pig grouping, facilities cleaning, antigen exposure, visual symptoms of illness and percent death loss.

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The second part of this study is an on-farm visit. During the on-farm visit any questions pertaining to the questionnaire are answered. Blood samples are collected from 10 barrows and 10 gilts within each growth phase (nursery, growing and finishing). A diet sample is collected for each group of pigs sampled. The diet sample is analyzed for crude protein and plasma samples are analyzed for urea concentration.

Results

Currently, eight farms have been sampled with a total collection of 500 blood samples. The goal is to acquire at least 250 samples from five additional farms. Results from the analyzed samples show that gilts consistently have lower plasma urea concentrations than barrows when fed the same diet (Figure 1). Gilts fed a greater crude protein concentration in the growing stage (80 to 200 lb) have lower plasma urea concentrations than barrows. This indicates that gilts have improved use of protein for lean muscle deposition compared to barrows. Analyzed crude protein concentrations indicate that many pigs, especially in the finishing phase (200 to 270 lb), are overfed protein.

Survey results show that on average 2,400 pigs/year are sold per operation. Lean gain potential on most operations is considered to be in the high category (> .72 lb/d). Data from the kill sheets show that the average backfat depth is .78 inches, loin depth is 2.30 inches, lean percentage is 54.5, yield is 75.4 %, hot carcass weight is 187 lb, average weight at the beginning of the growing-finishing period (including nursery) is 12 lb, average weight at slaughter is 254 lb, and the number of days from the start of the finishing period to slaughter is 173. Separate sex feeding is used on most

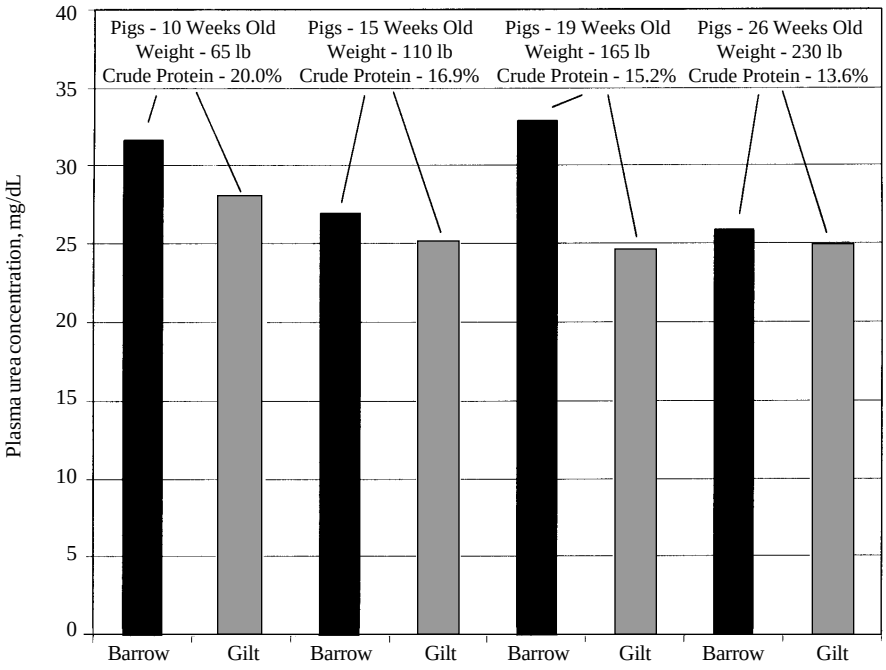

Figure 1. Example of gilts consistently having lower plasma urea concentrations than barrows when fed the same diet. Data derived from one farm. Dietary CP concentrations varied from approximately 13 to 20%.

operations. The majority of pig flow is all-in-all-out in the nursery and growing-finishing facilities, with most pigs raised in mechanically ventilated confinement buildings. Space per pig in the nursery averaged 3.25 ft^2/pig and in the growing-finishing phase it averaged 8 ft^2/pig. All facilities are routinely high-pressure washed and disinfected between pig groups. Facility biosecurity was minimal (same site and labor, clean coveralls and boots) on most operations. Mycoplasmal hyopneumonia and Porcine Respiratory and Reproductive Syndrome are the two main diseases to which pigs are exposed. Average death loss in the nursery was 2 to 3% and during the growing-finishing period was 3 to 4%.

Conclusions

Results from the on-farm study have produced similar results to those acquired from our research facilities. These results show that plasma urea concentrations have the potential to be used as an indicator of protein requirements of growing-finishing pigs. Plasma urea concentrations may also be used to determine the correct weight to change diets throughout the growing-finishing period. However, nutrient requirements are not the same for each growth phase on each operation and reflect variation in management, disease and facilities. This approach may assist producers to determine the correct nutrient density and the correct time to switch diets that will maximize growth and minimize production costs.

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