4B-109: Sulphur amino acid supplementation to improve herd feed conversion efficiency in commercial grower production system

Project Leader - Dr Jae Kim, Department of Agriculture and Food of Western Australia

Background

Pigs kept under commercial conditions are continuously exposed to microorganisms, and typically respond to these immune system challenges by elevated release of cytokines, increased metabolic use of protein, and decreased protein deposition. A mild bacterial disease challenge for example, may significantly alter nutrient partitioning from protein deposition to the synthesis of immune molecules, and hence the amino acids used for the synthesis of these molecules may become deficient in diets and limit maximum rates of protein deposition. Sulphur amino acids, especially cysteine, are one of the most abundantly used amino acids for synthesis of immune function-related molecules. A previous study indicated that when the pig's immune system is activated, a significant proportion of sulphur amino acids are re-directed and retained in non-protein compounds such as glutathione, while at the same time muscle protein anabolism is compromised. However, the role of sulphur amino acids on protein utilization efficiency of finisher pigs grown in commercial production facilities, where pigs are continuously exposed to immune system challenges, has not been explored as yet. Therefore, the rationale for this project was that the current recommendation for SAA requirement based on empirical studies at a hygienic research facility may significantly underestimate the true SAA requirement for finisher pigs housed in less hygienic commercial facilities and significantly reduce herd feed conversion efficiency.

Methodology

To determine the SAA requirement of finisher pigs housed in commercial pig production systems, two experiments were conducted. The first pilot experiment was conducted in a research facility (Medina Research Station) using an immune system activation model. Pigs (50-100 kg) received twice-weekly intramuscular injection of either sterile saline or E. coli endotoxin, to simulate conditions in a hygienic research facility or continuous pathogen exposure under commercial conditions, respectively, to compare the role of increasing dietary SAA on protein utilization efficiency. The second experiment was conducted in a commercial farm (Rivalea Australian Pty Ltd), to validate the findings of the pilot study using a dose-response design.

Key Findings/Conclusions

The pilot study clearly demonstrated that SAA requirement expressed as a proportion of lysine for immune system activated pigs was 0.75 and was significantly higher than for healthy pigs at 0.55. Unlike healthy pigs, immune system activated pigs did not achieve maximum protein deposition (67 vs. 59 g/d, respectively) at the current recommended SAA level of 0.55. However, protein deposition rate in immune system activated pigs returned to the pre-infection level of 67 g/d when the dietary SAA:lysine ratio was increased to 0.75. Based on assumption that the E. coli endotoxin model represents the level of pathogen challenges in the commercial facility, the results of this pilot study indicate that increasing dietary SAA in commercial finisher pigs will significantly improve herd feed conversion ratio.

Results of the commercial validation study indicated that minimum feed conversion ratio and maximum carcass gain were achieved at dietary SAA:Lys ratio of 0.73.

Potential Users of Information (including value assessment)

Pig nutritionist, formulator, feed company, pork producer, veterinarian, and consultant.