17 Challenges and implications of feeding diets with excess concentrations of leucine to growing-finishing pigs. Mike D. Tokach[1], Henrique S. Cemin[2], Hayden R. Kerkaert[1], Jason C. Woodworth[3], Steve S. Dritz[1], Joel M. DeRouchey[1], Robert D. Goodband[1], *[1]Kansas State University, [2]Hubbard Feeds, [3]Department of Animal Sciences & Industry, College of Agriculture, Manhattan, KS 66506*

Excess dietary leucine stimulates the key enzymes involved in branched-chain catabolism causing breakdown of all branched-chain amino acids, including isoleucine and valine. Branched-chain amino acids share a common brain transporter with other large neutral amino acids (LNAA). Excess levels of one of the LNAA increases brain uptake of that amino acid and decreases the uptake of the other LNAA, including tryptophan. Thus, excess leucine can impact the requirements for many amino acids. From a practical basis, this effect was first demonstrated with diets containing blood meal, but was thought to be of limited concern unless high blood meal diets were fed. Use of corn dried distillers grains with solubles (DDGS) or high protein DDGS in corn-based diets results in diets containing excess leucine. These high leucine levels are of limited concern if adequate levels of other branched-chain amino acids and LNAA are fed, which is often the case if the diet consists largely of intact protein sources. Feed grade amino acids, such as L-lysine, L-threonine, L-tryptophan, DL-methionine, L-valine, and L-isoleucine have been widely adopted as a means to lower nitrogen excretion and diet cost. Including these amino acids in diets containing corn products reduces dietary leucine; but the resulting diets are formulated near the requirement for the first 6 limiting amino acids, including valine, isoleucine, and tryptophan, while still being high in leucine. The excess leucine increases the requirements for valine, isoleucine, and possibly other LNAA, such as tryptophan and possibly others. The exact relationship between these amino acids and how to handle them in practical diet formulation is still being elucidated; however, recent meta-analysis and experimental data confirm the importance of these ratios and provide useful direction for future research.

Keywords: Branched-chain amino acid, Isoleucine, Leucine, Pig, Tryptophan, Valine

14 Challenges and opportunities for formulating low-protein diets for maintaining growth and N-retention of weanling and growing-finishing pigs. John K. Htoo[1], *[1]Evonik Nutrition & Care GmbH*

For more than two decades, numerous studies have been conducted evaluating the effects of lowering CP level in pig diets. It is now accepted that lowering dietary CP level and adding crystalline amino acids (CAA) improves N utilization and consequently reduces N excretion. Increased availability of CAA such as Lys, Thr, Met, Trp, Val (Ile, Arg and His) allows nutritionists to further reduce dietary CP level while meeting pigs' AA requirements more closely. However, pig performance was sometimes compromised when the dietary CP level was reduced more than 4 percentage units and adding high inclusion levels of CAA. An increase in backfat thickness was also sometimes reported when feeding finishing pigs with low CP diets. The potential reasons for such inconsistent results are due to the deficiency of the next limiting AA (typically Val and Ile), inaccurate feed mixing and insufficient amount of non-essential AA (NEAA) in the low CP diets. Formulating low CP diets on similar energy content as for the high CP diets on ME basis sometimes led to a greater backfat thickness in finishing pigs which was mainly due to increased energy utilization of pigs fed low CP diets coupled with the excess energy being stored as carcass fat. Based on the results of these experiments, optimal growth performance, carcass quality and N retention of pigs can be maintained when low CP diets are balanced for adequate levels of both essential AA and NEAA on the standardized ileal digestible basis combined with formulating on NE basis. Research suggests that keeping a maximum total Lys:CP ratio of 7.4% could overcome deficiency of NEAA in the low CP diets. Based on published N-balance studies, 1 percent unit dietary CP reduction results on average 9% reduction in N excretion in pigs which is an effective approach to become more sustainable pork production.

Keywords: amino acids, low protein, pigs