Effect of Dietary Crude Protein Cotent and Phase Feeding on Performance and Urinary Nitrogen Excretion of Grower Pigs

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Summary

Nitrogen excretion is of concern because of its potential impact on the environment inside and outside the barn. Urinary nitrogen excretion can be reduced using dietary manipulations. Results indicate that a 2% reduction of dietary protein content throughout the grower phase reduced urinary nitrogen excretion by 22% without affecting performance. Phase feeding did not affect urinary nitrogen excretion or performance.

Urinary nitrogen excretion can be reduced more effectively by reducing dietary protein content than by using phase feeding.

Introduction

Urinary nitrogen is emitted easily as ammonia while faecal nitrogen is less volatile because it is bound within proteins. Reduction of dietary protein while balancing for amino acids is a direct way to reduce urinary nitrogen excretion and ammonia emission. Phase feeding might allow a better dietary matching of the rapidly changing amino acid requirements of grower pigs and thereby further reduce the urinary excretion of excess dietary nitrogen.

Experimental Procedures

Two levels of dietary crude protein (high, avg. 19%; low, avg. 17%; ideal amino acid profile 3,400 kcal DE/kg) and three different phase feeding programs (2 diets for 3 week each, 3 diets for 2 week each, and 6 diets for 1 week each; Figure 1) were used as six treatments in a 2 x 3 factorial arrangement with 27.5-kg barrows. In a performance study, pigs were housed five pigs/pen with free access to feed. In a metabolism study, pigs were housed in individual pens; faeces and urine were collected.

Results and Discussion

In the 6-week performance study, average daily gain (ADG; Figure 2) and average daily feed intake did not differ between the high and low crude protein level or among the three phase feeding programs. For successful implementation of dietary strategies to reduce nitrogen excretion, growth performance should not be reduced. For the entire six-week metabolism study, urinary nitrogen excretion was reduced 22% by feeding low instead of high protein diets (Figure 3) but did not differ among the three phase feeding programs. Faecal nitrogen excretion did not differ among the dietary treatments.

Implications

Lower total nitrogen excretion may reduce land base needed to apply manure in a sustainable manner. Lower urinary nitrogen excretion will reduce ammonia emission inside and outside the barn. The cost for implementing low protein diets will greatly depend on fluctuating ingredient prices. For example at the present time for diets with an optimized digestible nutrient content, a 2% reduction in dietary crude protein increases the cost by $ 5 to 10 per tonne.

Acknowledgements

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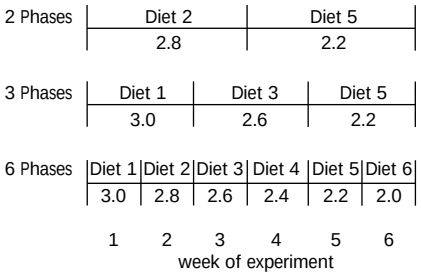

Figure 1: *The three phase feeding programs with lysine values in g dig. lysine per Mcal DE. Diet 1 contained 21.5 (high) or 19.5% (low) crude protein in 1% increments down to 16.5 (high) or 14.5% (low) crude protein for Diet 6.*

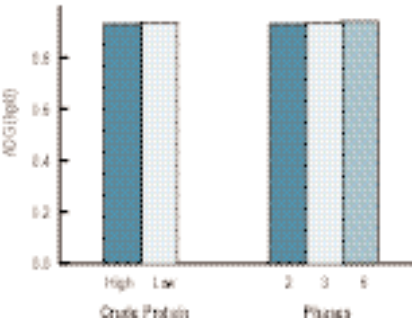

Figure 2: *Effects of dietary crude protein and phase feeding on average daily gain of grower pigs in the 6-week performance study.*

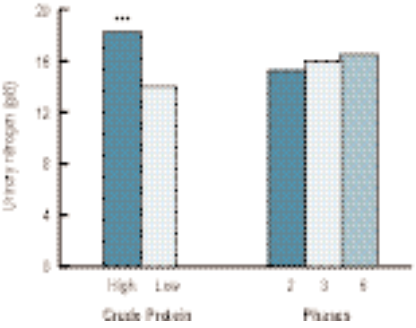

Figure 3: *Effects of dietary crude protein and phase feeding on urinary nitrogen excretion of grower pigs in the 6-week metabolism study.*

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