Dietary Particle Size and Nutrient Supply Affect Nitrogen Excretion

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Summary

Diets based on barley and peas ground to two particle sizes and with one of two diet formulations (either limiting in energy or amino acids) were fed to cannulated grower pigs. Energy digestibility was affected by particle size but not diet formulation. Total nitrogen excretion was affected by diet formulation, but not by particle size.

Nitrogen excretion has more to do with feed formulation than particle size.

Introduction

Nutrient management may impact the sustainability of the pork industry. Particle size reduction may reduce fecal nitrogen excretion; however, it may also result in an increase in urinary nitrogen excretion (*2000 Annual Research Report*). In this study, effects of particle size and diet formulation on energy digestibility and nitrogen excretion patterns were investigated.

Experimental Procedures

Diets (barley, peas, soybean meal) with a particle size of 600 or 900 mm were formulated to be either high in amino acids (High AA; 2.8 g dig. Lys/Mcal DE, 3,150 kcal DE/kg) or high in energy (High DE; 1.8 g dig. Lys/Mcal DE, 3,400 Mcal DE/kg). Diets were fed to grower pigs cannulated at the end of the small intestine (ileum). Feces, digesta, and urine samples were collected. Daily feeding rates were adjusted to three times maintenance.

Results and Discussion

Reducing particle size from 900 to 600 mm increased total tract and ileal energy digestibility by 3% and 11%, respectively (Figure 1). Energy digested at the small intestine is more efficiently used than energy digested in the large intestine; thus, particle size reduction may improve energy utilization more than expected from improvements in total tract energy digestibility. Reducing particle size from 900 to 600 mm did not alter urinary or total nitrogen excretion, but reduced fecal nitrogen excretion 11% (Figure 2), indicating that particle size reduction improved nitrogen digestibility but did not reduce total (feces + urine) nitrogen excretion. Pigs fed High AA-diets excreted 29% more nitrogen, but also retained 31% more nitrogen than pigs fed High DE-diets. Total nitrogen excretion and nitrogen retention (as % of nitrogen intake) were not different between diet formulations.

Implications

Particle size reduction may improve overall energy utilization more than explained by improvements in total-tract energy digestibility. Reducing particle size was effective in reducing fecal but not total nitrogen excretion. Diet formulation is more effective in reducing nitrogen excretion.

Acknowledgements

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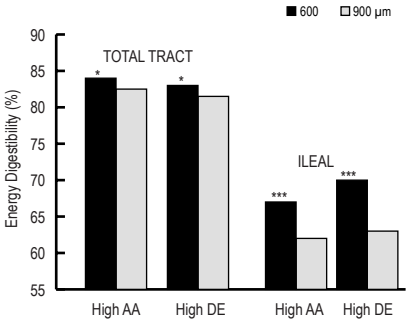

Figure 1 **Apparent energy digestibility at the end of the small intestine and of the total tract for diets with two particle sizes either high in energy or amino acids.**

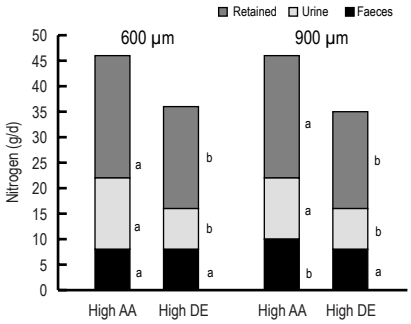

Figure 2 **Nitrogen intake separated into nitrogen excreted in urine and feces and retained for diets with two particle sizes either high in energy or amino acids.**

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