EFFECT OF DIETARY PROTEIN AND FIBER ON NITROGEN EXCRETION

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Summary

Nitrogen excretion is of concern because of its potential impact on the environment inside and outside the barn. Reduction of dietary protein content decreased overall nitrogen excretion, but especially in the urine. Urinary nitrogen excretion could be predicted from plasma urea nitrogen (PUN) concentration.

Introduction

The intensification of pig production has raised environmental concerns. Urinary nitrogen is emitted easily as ammonia while fecal nitrogen is less volatile because it is bound within proteins. Reduction of dietary protein is a direct way to reduce nitrogen excretion and ammonia emission. Nitrogen excretion can be shifted from urea in urine to bacterial protein in feces with dietary fermentable carbohydrates. In the present study, effects of three levels of protein and two levels of fiber on nitrogen excretion patterns were investigated.

Experimental Procedures

Diets (wheat, barley, soybean meal; oat-hulls as a fiber source) were formulated to 3250 kcal DE/kg and 2.18 g Dlys/Mcal, supplemented with synthetic amino acids. Feces, urine and blood samples were collected. Daily feeding rates were adjusted to three times maintenance.

Results and Discussion

Fecal nitrogen was decreased 10 and 23% respectively for low compared to medium and the high protein diets (Figure 1). Urinary nitrogen was reduced 35 and 48% respectively for low compared to medium and high protein diets. Excretion of nitrogen was reduced 26 and 40% respectively for low protein compared to medium and high CP diets. Dietary fiber did not affect urinary, fecal and total N excretion. Oat hulls might not be a good source of fermentable carbohydrates for grower pigs. Retention of N was reduced 9 and 18% respectively for low compared to medium and high CP diets. Nitrogen retention was 6% higher for the high compared to low fiber diets. Regression analysis showed that PUN could predict urinary N excretion (Figure 2).

Implications

Reduction of dietary protein content is effective in reducing nitrogen excretion, especially urinary nitrogen. Oat hulls did not affect nitrogen excretion, probably because of the low content of fermentable carbohydrates. Further research is required to maintain protein deposition. Models to predict urinary N excretion might be helpful to access N status on farms.