

Performance Maintained with Low Protein Diets

John F. Patience, A. Denise Beaulieu, Ruurd T. Zijlstra, Doug A. Gillis and James Ursy¹



Summary

Successful formulation of low protein diets increases our flexibility in formulating practical diets, provides us with another tool to lower nitrogen output in the slurry and to reduce greenhouse gas emissions. This experiment was conducted to compare the performance of pigs fed regular protein versus low protein diets. Average daily gain, average daily feed intake and feed efficiency were unaffected by dietary treatment. Most carcass characteristics, including index, lean yield and backfat thickness were unaffected by treatment; however, loin muscle thickness was increased on the low protein diet. Lower CP diets can be fed successfully without negatively impacting performance or carcass quality.



Introduction

There is increasing interest in formulating diets with lower crude protein content. The declining cost of synthetic amino acids, a desire to minimize the nitrogen content in the slurry and interest in reducing greenhouse gases all contribute to this

interest. However, in the past, low crude protein diets sometimes reduced growth performance and often resulted in fatter carcasses.

Experimental Procedures

This experiment employed three dietary treatments. The control diet was formulated to contain a level of crude protein that required no more than 0.1% L-Lysine HCl to meet the pig's requirement for lysine, i.e. a typical diet used by the pork industry today. The low protein diet was formulated with the lowest possible crude protein level without

"Very high levels of synthetic amino acids can be fed without impairing grower-finisher performance."

using any synthetic L-tryptophan. In other words, levels of L-lysine HCl, DL-methionine and L-threonine were allowed to float in order to meet the pig's requirement for these three essential amino acids. This resulted in diets that contained as much as 3.5 kg L-lysine HCl, 1.4 kg L-threonine and 40 g DL-methionine per tonne of complete feed; these levels are clearly well above current commercial practice. A third diet was formulated to be intermediate in crude protein level between the other two. Diets were formulated to maintain a constant NE:Lysine ratio and equal levels of minerals and vitamins.

There were a total of 5 pens and 110 pigs per treatment for a total of 660 pigs (330 gilts and 330 barrows). All pigs were housed in fully slatted concrete floored pens measuring 5.8 X 2.4 m. with spindle penning dividers. Pigs were housed 22 to a pen, providing 0.65 m²/pig. Pigs were on test from 30 kg to 115 kg.

¹Ajinomoto Heartland, Chicago, IL., USA

Results

Overall, performance was excellent, with growth rates averaging 959 g/d. Feed conversion was also a very good 0.359, or 2.79:1. The uniformity of performance was also very good, with the SEM for daily gain only 8 g/d and for feed intake only 25 g/d.

There were no significant effects of crude protein on average daily gain, average daily feed or feed efficiency ($P>0.10$). However, there was a significant interaction between treatment and days on test ($P<0.05$).

Reducing crude protein had no negative effects on carcass quality; surprisingly, the lowest crude protein diet resulted in the thickest loin ($P<0.05$). Premiums were higher on the low protein diet as was the returns over feed cost. The feed cost considers the cost of the diet and days on test, which increased as dietary crude protein decreased.

Financial Implications

As expected, gilts indexed higher than barrows (111.9 vs. 109.7), with higher lean yield (60.4% vs 59.2%), less backfat (19.1 mm vs 21.4 mm), a thicker loin (61.6 mm vs 59.0 mm), a wider backfat:loin spread (42.5 mm vs 37.6 mm) and earning higher quality premiums (\$4.83 vs \$4.07). These gender effects are all within the expected range. The thicker loin on the low protein diet was unexpected and is currently being repeated to see if these results can be replicated.

Detailed results of this experiment can be obtained by requesting Monograph No. 02-03 from the Prairie Swine Centre.

Table 1. Effects of protein level on pig performance.

	Treatment					
	Male			Female		
	High	Medium	Low	High	Medium	Low
Phase I (30-60 kg)						
Ave. Daily Gain, kg.	0.94	0.92	0.96	0.93	0.91	0.91
Ave. Daily Feed, kg.	2.05	2.01	2.10	2.03	1.97	2.03
Gain:Feed	0.46	0.46	0.46	0.46	0.46	0.45
Phase II (60-90 kg)						
Ave. Daily Gain, kg.	0.95	0.95	0.96	0.93	0.92	0.93
Ave. Daily Feed, kg.	2.87	2.81	2.92	2.75	2.56	2.62
Gain:Feed	0.33	0.34	0.33	0.34	0.36	0.36
Phase III						
Ave. Daily Gain, kg.	1.04	1.06	1.03	1.02	1.02	1.02
Ave. Daily Feed, kg.	3.65	3.54	3.58	3.17	3.24	3.26
Gain:Feed	0.29	0.30	0.29	0.32	0.31	0.33

Conclusions

When diets are formulated on a net energy basis, synthetic amino acids used judiciously, and dietary electrolyte balance is maintained reasonably constant, crude protein levels can be reduced and performance maintained. Indeed, as evidenced by the thicker loin eye on the low protein diet, carcass quality may be improved.

Acknowledgements

Support for this project was provided by Ajinomoto Heartland. Strategic program funding is provided to the Prairie Swine Centre by Sask Pork, Alberta Pork, Manitoba Pork Council and Saskatchewan Agriculture and Food Development.



Prairie Swine Centre

Box 21057
2105 8th Street East
Saskatoon, Saskatchewan
S7H 5N9

Phone (306) 373-9922
Fax (306) 955-2510
Website: www.prairieswine.ca