

The Methionine Requirement of Pigs From 25 to 50 kg

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Summary

In Western Canada, many protein sources such as peas and lentils which are lower in methionine (total methionine, tMet) than traditional protein sources are being used with greater frequency and in greater amounts. To ensure these diets are properly balanced, an experiment was conducted to establish the methionine requirement for 25 - 50 kg pigs. The requirement for female pigs was 0.25% of the diet and was slightly higher for barrows, at 0.29%. Ileal digestibility of methionine (d met) was 83%. The tMET requirement as a percent of lysine was 23% in females and 27% in males.

Introduction

Methionine is not a limiting amino acid in most commercial swine diets in North America. Thus, it has not been studied as intensively as other amino acids such as lysine, threonine and tryptophan. However, since certain popular ingredients, such as field peas and lentils, are poor sources of sulphur-amino acids (SAA), and since these ingredients are being used with greater frequency and in greater quantities, nutritionists need information on these amino acids to formulate practical diets

Experimental Procedures

Six diets were formulated, containing incremental levels of methionine. The basal diet was formulated to contain 0.19% tMET (0.16% dMET) and 0.36% TSAA (0.28% dSAA). Cystine represented 50% of TSAA in the basal diet.

A total of 150 gilts and 150 barrows were housed in fully slatted concrete floored pens measuring 3.96 m² per pig for 28 day growth trials. All pigs were scanned using real-time ultrasound on day 28. Ileal digestibility of the amino acids in the diets was measured in six barrows (75 ± 4 kg) in a related study. Estimates of methionine requirements were computed using orthogonal polynomials.

Results

The experiment was designed with five blocks. However, because feed consumption was greater than anticipated, blocks 4 and 5 were terminated after 14 days.

The gilts' growth response to increased methionine was both linear ($P < 0.03$) and quadratic ($P < 0.04$). Conversely, the response of barrows was neither ($P > 0.05$). The ADG of the barrows averaged 930 g/day, 500 g/day greater than the ADG for female pigs ($P < 0.01$, gender).

The effect of methionine on feed intake followed a pattern similar to the average daily gain. The overall response in feed intake to dietary methionine showed that gender ($P = 0.08$), but not diet ($P = 0.12$), tended to influence the response.

Feed efficiency (gain:feed; G:F) improved in barrows as methionine increased from 0.18% of the diet, to about 0.31% of the diet. In gilts, feed efficiency responded in neither a quadratic nor a linear fashion as the level of methionine increased.

Methionine concentration in the diet affected lean ($P < 0.01$), but not backfat ($P = 0.40$) thickness. The thickness of backfat in gilts tended to respond in a linear ($P = 0.08$) and a quadratic ($P = 0.06$) fashion as the level of methionine in the diet increased.

It is not unusual in studies on amino acid requirements to obtain different results between different genders and using different response criteria.

Apparent ileal digestibility of crude protein and methionine was 83.8% and 83.0% respectively. The apparent digestibility of the other amino acids ranged from 73% for lysine to 92% for glycine. The digestibility of lysine was lower than expected, but was double-checked and the initial results confirmed.

Table 2 summarizes the methionine requirement calculated from variables which responded (or tended to respond) in a quadratic

fashion with increased dietary methionine. The tMET requirement for females was found to be 0.25%, but ranged from 0.23 to 0.28% of the diet, depending on the criteria employed. This was equivalent to 4.7 g/d, with a range from 4.4 to 5.4 g/d. The tMET requirement for barrows, is about 0.29% of the diet, or 4.9 g/d. The diets contained 3.45 Mcal DE/kg. Therefore, the tMET requirement can also be expressed as 0.73 g/Mcal DE, with a range from 0.67 to 0.81. Based on protein gain, these pigs require 34.7 mg tMET per gram of protein gain, with a range from 32.9 to 39.1 mg. Our data indicates that female pigs within this weight range require 23% tMET as percent of lysine, with a range from 21.5 to 26.2%. The comparable requirement for barrows is 27% tMET/lysine.

*Methionine can be lacking
in diets containing pulse
crops like peas and lentils.*

Implications

The methionine requirement has been defined for 25 to 50 kg pigs. Information on methionine requirements is most critical in pigs fed diets containing field peas, lentils, or other pulse crops known to have low levels of this amino acid.

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Table 1. The effect of methionine on the average daily gain of weaned pigs. (d 0 - 28).

	Methionine (% of diet)						SEM	P-values	
	0.18	0.22	0.25	0.28	0.31	0.32		Linear	Quad
<i>Barrows</i>									
ADG (kg/d)	0.80	0.89	0.96	0.92	1.04	0.97	0.03	0.15	0.28
ADFI (kg/d)	1.78	1.87	1.93	1.86	2.03	1.96	0.04	0.59	0.82
G:F	0.45	0.48	0.50	0.50	0.51	0.50	0.01	0.03	0.06
Backfat (mm) ^a	10.6	12.0	11.7	11.7	13.1	12.7	0.74	0.78	0.91
Lean (mm) ^a	35.14	37.67	37.56	37.53	39.57	40.30	0.95	0.89	0.84
<i>Gilts</i>									
ADG (kg/d)	0.83	0.84	0.94	0.91	0.86	0.87	0.02	0.03	0.04
ADFI (kg/d)	1.87	1.81	1.94	1.94	1.73	1.75	0.05	0.08	0.06
G:F	0.45	0.47	0.48	0.47	0.49	0.50	0.01	0.12	0.27
Backfat (mm) ^a	11.5	11.9	12.7	12.4	9.8	11.4	0.44	0.08	0.06
Lean (mm) ^a	37.54	37.97	39.41	39.71	39.61	39.63	0.66	0.28	0.41
^a Determined on d 28									
P values	ADG	ADFI	G:F	Backfat	Lean				
Diet	<0.001	0.12	<0.001	0.40	0.007				
Gender	0.01	0.08	0.03	0.43	0.15				
Gender*diet	0.01	0.001	0.65	0.02	0.37				

Table 2. The methionine requirement of weaned pigs calculated using different response criteria and reported as proportions of the diet or other nutrients, and grams per day.

Response factor	Phase	tMET	tMET	tMET/DE	tMET/	tMET/tSAA	tMET/LYS
		(% of diet) ^a	(g/d) ^b	(g/Mcal)	g protein gain (mg/g) ^c	(x 100)	(x 100)
<i>Gilts</i>							
ADG	d0 - 14	0.26	4.37	0.75	32.9	56.9	24.0
ADG	d14-28	0.27	5.40	0.78	39.1	58.9	25.1
ADG	d0-28	0.26	4.78	0.75	35.1	56.9	24.0
ADFI	d14-28	0.24	4.80	0.70	34.8	54.5	22.2
ADFI	d0-28	0.24	4.42	0.70	32.5	54.5	22.2
Gain:feed	d0-14	0.28	4.70	0.81	35.3	59.6	26.2
Backfat	d28	0.24	4.80	0.70	34.8	54.5	22.2
Urea	d28	0.23	4.60	0.67	33.3	53.5	21.5
<i>Barrows</i>							
Gain/feed	d0-14	0.29	4.90	0.84	35.5	60.4	27.1

^a Calculated from regression analysis.

^b Calculated using ADFI data.

^c Calculated assuming 15.5 % of gain is protein.

^d Calculated from the TSAA content of the diet and the TMET requirement determined from the regression analysis.

^e Calculated from the lysine content of the diet and the TMET requirement determined from the regression analysis.