



# NUTRITION NOTES

Innovation + Research from Kent Nutrition Group

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## SYNTHETIC AMINO ACIDS VS. SOYBEAN MEAL IN GROW-FINISH PIGS

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### INTRODUCTION:

Through Kent research in 2014, we determined that a level of “12 lb/ton” of synthetic amino acids [lysine (Lys), threonine (Thr), methionine (Met), tryptophan (Trp)] performed similar to our standard “8 lb/ton” of synthetic amino acids (lysine, threonine, methionine). When Met is added to the diet, it is also converted in the pig into another sulfur amino acid called Cystine (Cys). So in our diet tables you will see the term Met + Cys which refers to these two sulfur amino acids that are needed in pig diets. We also evaluated higher levels of synthetic amino acids (with lower soybean meal levels) and these did not do as well as the 12 lb/ton level. The terminology that we are using to express amino acid requirements is based on the digestible levels of these amino acids (called standardized ileal digestible or SID) which reflects the amount of each amino acid absorbed and utilized for efficient synthesis of muscle. Amino acid requirements are based on the ratio of essential (those amino acids that must be supplied in the diet such as threonine, methionine and tryptophan) amino acids to lysine since lysine is the first limiting amino acid in swine diets. Since the Kent SID lysine levels (and KNG amino acid ratios) were established in trials in 2009 to 2011, we have decided to see if a higher level of amino acids (by raising SID lysine by 0.05 units and using the KNG amino acid ratios) would provide a growth and economic response in current genetics (DNA Boar x Choice Sow). In one treatment (AA), we locked in soybean meal levels at those used in the “12 lb/ton” diets (Standard) from 2014 and allowed only synthetic amino acids to increase. In a third set of treatments (SBM), we “locked in the synthetic lysine” levels from the “12 lb/ton” diets and allowed soybean meal to increase to get the 0.05 unit increase in lysine with minor adjustments made with synthetic threonine, methionine and tryptophan. This treatment provided information as to whether other essential amino acids [Valine (Val), Isoleucine (Ile)] and/or nitrogen were needed to make non-essential amino acids (those amino acids a pig can biologically make provided enough nitrogen is in the diet since it is a key component of amino acids).

### PROCEDURES:

From the introduction above, we evaluated three treatments in this trial: 1. Standard (“12 lb/ton of synthetic amino acids involving synthetic lysine, threonine, methionine and tryptophan), 2. Standard with SID lysine increased by 0.05 units via synthetic lysine (AA) and 3. Standard with SID lysine increased by 0.05 units via an additional 40 lb/ton of soybean meal (SBM) compared to the Standard and AA diets. We utilized 1,310 pigs involving 54 to 58 replications per treatment. The pigs were fed a five-phase program utilizing NexGen VTM 6/5 PT and 200 lb/ton of Distillers Dried Grains with Solubles as shown in Tables 1-3.

The results of the trial are shown in Table 4 above. Increasing the synthetic amino acids (AA), and increasing the soybean meal (SBM) resulted in marked improvements in feed efficiency when compared to the standard diets. We did observe that pigs on the diets with AA did consume significantly less feed than those on the standard diets. There was also a significant improvement in percent lean from the added SBM along with numerically higher grade premiums that would also lead to an increase in value from the added SBM diets compared to the standard diets. At a market price of \$55/cwt live, increased AA decreased net return by \$0.66/hog marketed, while in contrast, increased SBM increased net return by \$0.65/hog marketed compared to pigs on the standard diets.

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# NUTRITION NOTES (continued)

**Table 1. Grower Diets During Days 0-42**

**Table 2. Finisher Diets During Days 42-94**

	Days 0-21			Days 21-42			Days 42-62			Days 62-94		
	Standard	+ AA	+ SBM	Standard	+ AA	+ SBM	Standard	+ AA	+ SBM	Standard	+ AA	+ SBM
Corn (7.0% CP)	1397.42	1394.76	1358.02	1468.48	1465.80	1429.16	1532.08	1529.38	1492.56	1582.35	1579.64	1543.01
SBM (46.85% CP)	352	352	392	282	282	322	221	221	261	172	172	212
DDGS (27% CP)	200	200	200	200	200	200	200	200	200	200	200	200
Calcium Carbonate	22.6	22.6	22.6	22.3	22.3	22.3	20.5	20.5	20.6	20.8	20.8	20.8
Monocalcium Phosphate 21%	2.8	2.8	2.0	2.4	2.4	1.5	1.8	1.8	1.0	1.0	1.0	0.1
Salt	7	7	7	7	7	7	7	7	7	7	7	7
6/5 VTM PT	6	6	6	6	6	6	5	5	5	5	5	5
L-Lysine HCl	8.00	9.28	8.00	7.94	9.22	7.93	8.18	9.46	8.16	7.96	9.24	7.95
L-Threonine	2.27	2.91	2.34	2.11	2.76	2.19	2.27	2.92	2.35	2.04	2.70	2.13
DL-Methionine	1.15	1.70	1.31	1.00	1.56	1.18	1.39	1.98	1.59	1.03	1.62	1.23
L-Tryptophan	0.46	0.65	0.43	0.47	0.66	0.44	0.48	0.66	0.44	0.52	0.70	0.48
Skycis	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
<b>Total, lb</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>
\$/Ton <sup>1</sup>	168.44	171.84	171.84	161.94	165.35	165.35	156.93	160.39	160.40	151.59	155.05	155.06
ME, Kcal/lb	1521	1519	1521	1522	1520	1522	1523	1521	1523	1524	1522	1524
NE, Kcal/lb	1029	1027	1026	1035	1034	1032	1042	1041	1039	1047	1046	1044
Crude Protein, %	16.4	16.5	17.2	15.0	15.1	15.8	13.8	13.9	14.6	12.8	12.9	13.6
Lys, %	1.08	1.13	1.14	0.98	1.03	1.04	0.91	0.96	0.96	0.83	0.88	0.88
SID Lys, %	.97	1.02	1.02	0.88	0.93	0.93	.81	0.86	0.86	0.74	0.79	0.79
SID Trp/SID Lys Ratio	18	18	18	18	18	18	17	17	17	17	17	17
SID Thr/SID Lys Ratio	63	63	63	63	63	63	64	64	64	64	64	64
SID Met+Cys/ SID Lys Ratio	54	54	54	55	55	55	58	58	58	58	58	58
SID Val/SID Lys Ratio	67	64	68	67	63	68	66	63	66	67	63	67
SID Ile/SID Lys Ratio	59	56	60	58	55	59	57	53	57	57	53	57

<sup>1</sup> Corn, \$3.35/bu or \$119.64/ton; SBM, \$290/ton; DDGS, \$119.64/ton

## DISCUSSION:

Increasing SID lysine by 0.05% over the Standard program resulted in a loss in net return of \$0.66/hog marketed by keeping soybean levels the same as the Standard treatment and increasing the four synthetic amino acids. In contrast, the SBM treatment (which increased SID lysine by 0.05%) resulted in a response in net return of \$0.65/hog marketed. So why the difference between the AA vs. SBM treatment? It could be that perhaps other essential amino acids were limiting such as isoleucine and valine since the added SBM treatment increased all the essential amino acids. Another reason could be that nitrogen was limiting in the diets which is critical in the synthesis of non-essential amino acids. The SBM diets had on average about 0.7 units more crude protein from the added 40 lb/ton increase in soybean meal. As amino acid technologies continue to emerge, it is conceivable that with competitive enough pricing that using isoleucine and/or valine could be evaluated at some point.

## SUMMARY:

Using the diets with both high levels of synthetic amino acids and the higher soybean meal levels resulted in a substantial improvement in net return per hog marketed (\$0.65 at a live price of \$55/cwt) and will become the new standard in feeding these genetically lean and fast-growing lines of pigs.

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## NUTRITION NOTES (continued)

**Table 3. Late Finisher Diets During Days 94-117**

	Standard	+ AA	+ SBM
Corn (7.0% CP)	1474.05	1471.29	1434.56
SBM (46.85% CP)	279	279	319
DDGS (27% CP)	200	200	200
Calcium Carbonate	18.1	18.1	18.2
Monocalcium Phosphate 21%	1.5	1.5	0.6
Salt	7	7	7
6/5 VTM PT	5	5	5
L-Lysine HCl	8.09	9.37	8.07
L-Threonine	2.71	3.39	2.82
DL-Methionine	2.19	2.82	2.43
L-Tryptophan	0.36	0.53	0.32
Paylean 2.25 g/lb	2	2	2
<b>Total, Lb</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>
\$/Ton	179.55	183.08	183.08
ME, Kcal/Lb	1524	1521	1524
NE, Kcal/Lb	1038	1036	1035
Crude Protein, %	15.0	15.1	15.8
Lys, %	0.98	1.03	1.04
SID Lys, %	.88	0.93	0.93
SID Trp/SID Lys Ratio	17	17	17
SID Thr/SID Lys Ratio	66	66	66
SID Met+Cys/SID Lys Ratio	61	61	61
SID Val/SID Lys Ratio	67	63	67
SID Ile/SID Lys Ratio	58	55	58

**Table 4. Effect of Synthetic Amino Acids (AA) vs. Soybean Meal (SBM) on Overall Performance, Economics & Carcass Traits in Grow-Finish Pigs**

Treatments	Standard	+ AA	+ SBM
Number of Pigs	420	438	452
Number of Pens	54	56	58
Initial Wt, lb	39.00	38.85	38.94
<b>Days 0-117</b>			
ADG, lb	2.060	2.046	2.076
ADFa, lb	5.622	5.485	5.546
F/Gab	2.727	2.677	2.669
Cost/lb Gain, ¢	22.17	22.24	22.17
<b>Net Return, \$/Pig</b>			
@ \$55/cwt live price	79.03	78.37	79.68
@ \$60/cwt live price	91.08	90.34	91.82
@ \$65/cwt live price	103.13	102.31	103.96
@ \$70/cwt live price	115.18	114.28	116.10
<b>Carcass</b>			
Percent Leanb	56.91	57.02	57.14
Dressing Percent	75.40	75.26	75.36
Grade Premium, \$/Cwt	7.05	7.01	7.20

*a*Standard vs. + AA ( $P < .05$ ); *b*Standard vs. + SBM ( $P < .05$ )

