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Lysine-to-calorie ratios explored to achieve minimum cost of gain

THE downturn in swine profitability has many swine producers considering how they can reduce their feed costs to weather the next several months of potential negative margins.

Normally, nutritionists would consider more aggressive use of high-fiber ingredients to reduce diet costs during these periods. However, the lack of a distillers grains supply due to ethanol plant shutdowns has greatly limited the availability of economical byproduct ingredients, leaving many nutritionists to contemplate how to decrease the cost of a corn/soybean meal swine diet.

In a past *Feedstuffs* Bottom Line of Nutrition article published in October 2018, I discussed some of the considerations for optimizing feed costs in low-profitability markets, with a focus on dietary energy density. In brief, the article demonstrated that the value of adding fat to increase gain in down markets often does not optimize income over feed costs, and minimizing the cost of gain with low-energy diets tends to be the optimum.

The 2018 article also highlighted the importance of minimizing grain particle size and tightening up feeder adjustments to maximize feed efficiency.

Another avenue to potentially reduce diet costs is to consider the lysine-to-calorie ratio fed relative to the pig's requirement for maximum gain and feed efficiency. Lysine is the first-limiting amino acid in swine diets and, thus, typically is used in formulation to set the amino acid density of a given diet.

Other essential amino acid requirements are set as ratios to lysine to ensure an optimum amino acid profile relative to the pig's needs for each stage of growth and allows for the use of crystalline forms of lysine, methionine, threonine, tryptophan, valine and isoleucine in diets in order to optimize costs.

Understanding that amino acids and energy are needed in proportion to each other for growth performance and carcass composition allows for the use of lysine:calorie ratios in formulation to adjust amino acid density as energy density changes.

The question of significantly lowering lysine relative to the maximum gain requirement has come up recently both in the context of reducing the cost of gain for forward markets as well as being a means of slowing down the pigs waiting in line for a trip to the packer.

A tool is available from PIC Genetics that calculates lysine requirements for weight ranges of PIC pigs and also allows users to make estimates of changes in income over feed costs based on lowering the lysine levels of the diets and comparing the corresponding changes in diet costs with estimated performance.

Bottom Line

with
DUSTIN DEAN*

Tables 1 and 2 provide a summary of estimated growth performance, feed cost and cost per pound of gain for pigs fed 60%, 70%, 80%, 90% or 100% of the PIC lysine requirement for maximum gain with soybean meal priced at $300 and $350 per ton, respectively.

Slightly modified assumptions regarding reductions in average daily gain (ADG) and feed conversion were used that represent a curvilinear response to decreasing lysine versus a linear response assumed in the PIC calculator.

A four-phase corn/soybean meal diet program with crystalline amino acids, limestone, monocalcium phosphate, phytase, salt and a vitamin/trace mineral premix were used to estimate diet costs from 50 lb. to 285 lb.

Corn was assumed to be $3.25/bu. in both scenarios, with current market prices used for all other ingredients. Grind, mix and delivery were added to the ingredient diet cost at a constant rate of $10 per ton.

The results of the evaluation demonstrate a high sensitivity to the cost of soybean meal in determining the lysine:calorie ratio that minimizes cost of gain. When soybean meal was priced at $300 per ton, very little difference in cost of gain was estimated, with all diet programs near 22 cents/lb. of gain and a minimum value at the 80% lysine level (Figure 1). However, when soybean meal was increased to $350 per ton, estimates of cost of gain continued to decrease down to the 60% lysine level.

Average diet costs decreased by nearly $29 per ton, but the actual feed cost savings per head were only $1.59 due to the extra feed required as feed efficiency decreased with lower lysine levels (Figure 2).

This evaluation doesn't consider the consequences of large reductions in ADG relative to finishing space availability to attain target market weights, incremental mortality, sort loss, lean premium or any calculations of income over feed and facility costs, which should all obviously be considered for specific production scenarios.

The goal of this article is simply to review the performance impacts of lowering lysine:calorie ratios relative to the maximum gain requirement and understand its impact on the cost of gain with

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1. Performance and feed cost of pigs at various percentages of lysine requirement for maximum gain assuming $300-per-ton soybean meal

Lysine, % of requirement	ADG	Feed: gain	Avg. feed cost, $/ton	Feed cost, $/head	Cost, cents/ lb. of gain
100	2.06	2.71	163.46	51.96	22.11
90	1.99	2.80	157.49	51.77	22.03
80	1.92	2.90	151.58	51.70	22.00
70	1.84	3.02	145.95	51.84	22.06
60	1.76	3.16	140.41	52.14	22.19

2. Performance and feed cost of pigs at various percentages of lysine requirement for maximum gain assuming $350/ton soybean meal

Lysine, % of requirement	ADG	Feed: gain	Avg. feed cost, $/ton	Feed cost, $/head	Cost, cents/ lb. of gain
100	2.06	2.71	170.94	54.34	23.12
90	1.99	2.80	163.49	53.74	22.87
80	1.92	2.90	156.06	53.23	22.65
70	1.84	3.02	148.98	52.91	22.52
60	1.76	3.16	142.04	52.75	22.45

current feed ingredient availability and pricing.

The Bottom Line

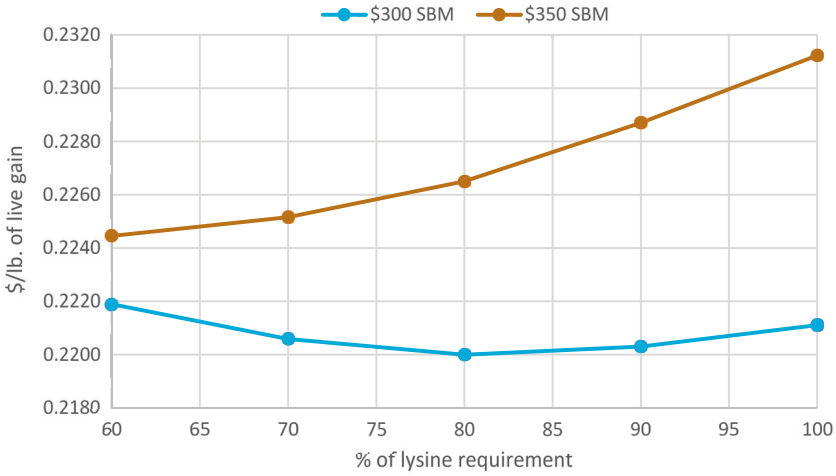
Formulating diets to lysine levels well below the requirement for maximum gain may offer opportunities to reduce the cost of gain when protein sources are expensive. However, in a market environment with relatively cheap soybean meal, lowering lysine levels provides little to no cost savings per head when fed to a common end point and has a limited ability to lower the cost of gain due to the extra maintenance costs associated with the pigs' slower growth.

Reducing lysine by 40% results in a projected daily gain reduction of 15%, which may be useful as part of a strategy to slow down some pigs for producers who are behind on marketings due to COVID-19 plant disruptions without increasing the cost of gain.

Reference

SID Lysine Economic Calculator for PIC Pigs. August 2018. Accessed at www.pic.com/resources/calculators. ■

1. Projected cost of gain for pigs at various lysine requirements for maximum gain at $300 and $350 per ton of soybean meal (SBM)



2. Projected average finishing feed cost at various lysine requirements for maximum gain at $300 and $350 per ton of soybean meal (SBM)