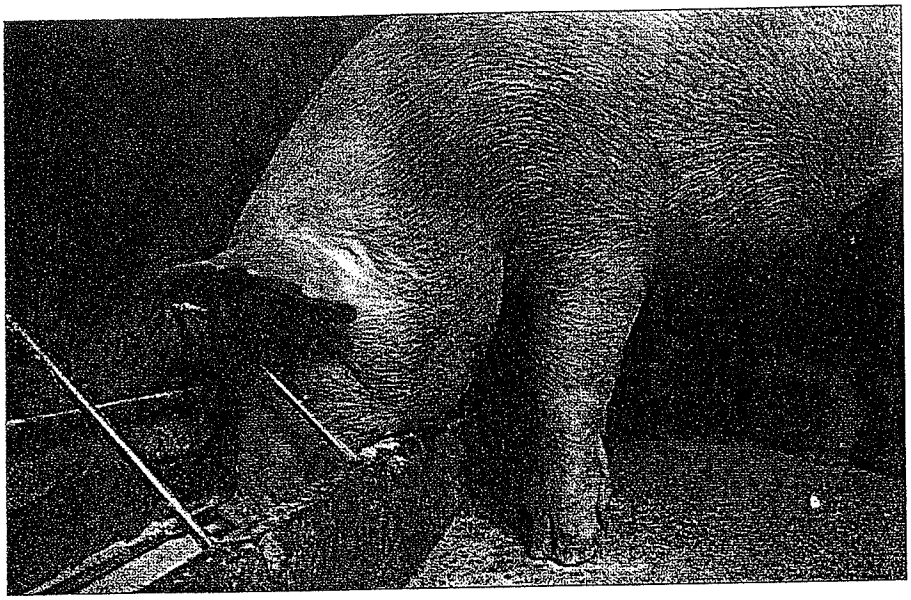

All Pigs Are Not Equal When Setting Lysine Levels

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With today's hog prices hovering near or below breakeven levels it is imperative that pork producers formulate their finishing rations to meet, but not exceed, requirements. Producers can ill afford to overfeed protein and lysine during the finishing period.

This creates as real dilemma, however, because recommendations for lysine vary widely. The NRC (National Research Council, 1988) recommendation is set at a constant .60% of the diet for both barrows and gilts weighing from 120 to 260 lb. Some breeding companies suggest 1.06% lysine for early-finishing gilts and .96% lysine for late-finishing gilts.

There is no question that during the finishing stage, 120 to 260 lb., lean pigs require higher levels of amino acids than fat pigs. And, gilts require higher levels of amino acids than barrows. Because of the wide variation in genetic capacity for lean growth in today's hogs, it is difficult to establish specific lysine or protein requirements that apply to all pigs under all conditions.

What to do? Do we throw up our hands in frustration, concluding it is all too complicated to understand, let alone explain? Perhaps we should just take the advice of the breeding companies.

We believe decisions regarding lysine levels for finishing pigs, though more complicated than before, are far less complicated than some people would have you believe.

Three-Year Lysine Study

We have been working for the past three years on lysine levels, protein levels and ideal ratios of amino acids (% of lysine) for early- and late-finishing barrows and gilts. The pigs used in this research were from Pig Improvement Company (PIC) Line 326 and Camborough 15 matings. The barrows typically gained 2.1 lb./day, gilts averaged 1.90 lb./day.

At a 250-lb. slaughter weight, the barrows generally measured 1.0-1.1 in. of 10th-rib backfat and about 5.8 sq. in. loineye areas. The gilts were leaner, .8-.9 in. of 10th-rib backfat and 6.5 sq. in. loineye areas. Lean gain per day averages were .8 lb/day.

Most in the industry would categorize these pigs as a high-lean genotype, although there are certainly leaner pigs being fed today.

Lysine Requirements

Lysine requirements for barrows and gilts during early- and late-finishing stages are outlined in Table 1. Our research showed that these lysine levels maximized pig performance and optimized measures of carcass leanness. It is clear that these pigs required higher levels of lysine during early finishing than the .60% recommended by NRC (1988). It is also clear that late-finishing pigs (190 to 260 lb.) required substantially lower levels of lysine than early-finishing pigs (120 to 190 lb.).

In translating the lysine requirement information in Table 1 to corn-SBM protein level recommendations, there are at least four options:

1. Use of corn and SBM without lysine addition for mixed sex feeding;
2. Same as Table 1 but with separate-sex feeding;
3. Use of crystalline lysine with mixed-sex feeding; or
4. Use of crystalline lysine with separate-sex feeding.

The recommendations shown in Table 2 represent corn-SBM diets that meet the lysine requirements listed in Table 1 for both barrows and gilts. Moreover, the diets in question provide levels of tryptophan, threonine and methionine (+ cystine) that are within the desired, ideal protein ranges for pigs at this weight.

For those who wish to make several diet changes during the finishing period, linear equations can be used to estimate the requirement for either barrows or gilts at any weight between 120 and 260 lb.

For our pigs, whose lysine requirements are outlined in Table 1, the equation is $L = 0.919 - 0.001539\ W$ for barrows and $L = 1.08 - 0.002154\ W$ for gilts, where L = lysine requirement of pigs between 120 and 260 lb. (% of diet) and W = body weight (lb.). This is shown graphically in Figure 1.

Pork producers should keep in mind that lysine levels, or corn-SBM protein levels to provide lysine, that maximize all measures of animal performance, may not be the same as lysine/protein levels that will maximize profits. University of Wisconsin data suggest that the incremental response to increased lysine is five times greater between 60 and 80% of the requirement (necessary to meet the need of all pigs in the population) than between 80 and 100% of the requirement. Thus, we have a situation of diminishing returns occuring in the upper portion of the response curve because of the variation in lysine needs of individual pigs.

Therefore, it is important to determine the economic returns from feeding a specific lysine level that meets the need for all pigs of a given sex in a given weight class compared to a

lysine level that will meet the needs of the average pig of the same sex and weight category.

Feed Intake

Much of the confusion surrounding lysine requirements can be traced to faulty assumptions regarding how voluntary feed intake affects those requirements. Clearly, within a given genetic line, it is incorrect to assume that the lysine requirement in grams/day remains constant at all feed intake levels. It is more likely that the requirements expressed as a percent of the diet remain constant at all voluntary feed intake levels.

Here's an example: Let's assume finishing gilts under ideal environmental conditions (plenty of feeder space, no crowding, no disease, no heat stress) will voluntarily consume 6.5 lb. of feed daily at a body weight of 220 lb. Let's also assume that these gilts are found, by experiment, to require .61% lysine or 18 grams/day. What will the lysine requirement be for these same pigs if they are "stressed" causing their voluntarily feed intake to drop to 6 lb./day?

Our research suggests that such "stressed" pigs do not benefit from increasing the dietary lysine concentration. Thus, their lean gain potential has now been reduced. They still require .61% lysine, but on a grams/day basis, they now require 16.6 grams/day instead of the 18 grams/day requirement of the unstressed pigs.

Recent research in The Netherlands has shown that the lysine requirement per unit of digestible energy remains constant at both low feed intakes (2.5 x maintenance levels) and high feed intakes (3.0 x maintenance levels).

Extrapolations

If we assume that within a given genetic line, lysine requirements (% of diet) of finishing pigs change very little as voluntary feed intake varies, but do change as a function of body weight, sex, and caloric density of the diet, we therefore can apply the recommendations shown in Tables 1 and 2, and Figure 1 to arrive at a best estimate of how best to feed your particular finishing pigs.

A few rules of thumb might help:

▶ Late-finishing pigs (190 to 260 lb. require about 2% less protein or .13% less lysine than early-finishing pigs (120 to 190 lb.).

▶ Early-finishing barrows require 1 to 1.5% less protein, or .07% less lysine than early-finishing gilts, and

▶ During late-finishing, the lysine requirement difference between sexes may be too small to justify two separate rations.

Using the data in Tables 1 and 2 as a reference base, we can increase or decrease lysine or protein levels by, say 10%, if the pigs we're feeding are leaner or fatter than those used to generate the tabulated recommendations.

If caloric density were to increase from 3,400 kcal ME/kg to 3,600 kcal ME/kg, by adding 3% dietary fat to the ration, the lysine requirement would need to be adjusted upward by 6% (3,600 minus 3,400, divided by 3,400).

Costs

If we consider that a finishing pig will consume in excess of 450 lb. of feed between 120 and 260 lb., it is obvious that overfeeding of protein and/or lysine can quickly deplete the profits from a swine enterprise.

For example, in a 10,000-pig operation, feeding Option 1 in Table 2 saves $6,000 compared with feeding a 15% CP diet throughout finishing. Obviously, a diet change at 190 lb. makes economic sense. Also, if we fed diets to finishing pigs that contained 1.0% lysine when they really needed lysine levels similar to those shown in Table 1, the cost to the 10,000-pig operation would be at least $35,000 in lost profits!

Conclusions

For pork producers to make intelligent estimates of what lysine level should be fed to finishing pigs, they must know something about their genetic potential for lean-muscle growth and the energy level of the rations being fed. They should also be aware that, regardless of genetics or dietary energy level, pigs during late finishing require substantially less lysine than they require in early finishing.

Finally, at the practical level, producers should focus on meeting a lysine need that will maximize profits. That means thinking more in terms lysine concentration – percent of diet or percent of calories – than on lysine intake (g/day).

The supposition that finishing pigs require a constant intake of lysine at all feed intake levels is wrong. ◇

Figure 1: Lysine Requirement (L) of Finishing Pigs At Various Body Weights (W)

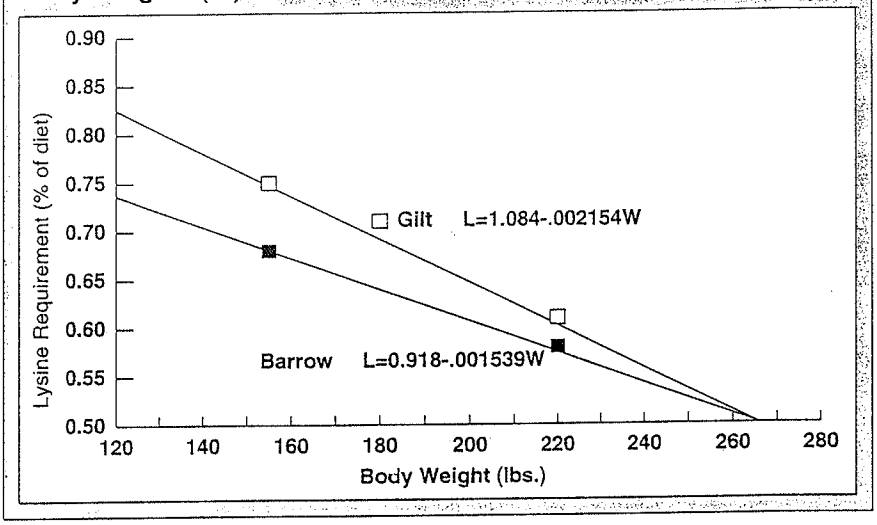

Table 1. Lysine Requirements (% of Diet) of Finishing PIC pigs[a]

Growth Period	Barrows	Gilts
120 to 190 lb.	.68	.75
190 to 260 lb.	.58	.61

[a]For corn-SBM diets containing 2 to 3% added fat.

Table 2. Calculated Corn-SBM Diets for PIC Finishing Pigs (Mixed-Sex Feeding)[a]

Body Weight (lb.)	Option I	Option II
120 to 190 lb.	15% *CP	13% *CP + .17% *FG *Lys
190 to 260 lb.	13% *CP	11% *CP + .17% *FG *Lys

[a]Assumes 95% of diet is corn and SBM.
[b]FG = feed-grade lysine (79% lysine activity).