

PIC® Nutrition Update

October 2016

▶▶▶▶▶ PIC lysine requirement update: Biology and economics

PIC has delivered dramatic increases in lean gain and efficiency to swine producers around the globe in the last decade. With an increase in growth rate and improved feed efficiency it is expected that, overtime, the nutrient concentration of the diets need to be updated to match the pig's needs to achieve its genetic potential. This document will detail the material and methods behind the new lysine requirement launched along with the new PIC nutrient specification manual.

The objective of this meta-analysis was to evaluate the standardized ileal digestible lysine requirement for PIC pigs. To accomplish this objective, a total of 27 experiments with PIC pigs under commercial conditions were used in the meta-analysis with a total of 45,102 pigs. Nine out of the 27 experiments were in partnership with JBS United. Each treatment within an experiment was considered as an observation (n=213) and each experiment was used as random effect. Ingredient loadings values used were based on NRC (2012). Requirement estimation models were implemented as per Gonçalves et al. (2016). Models that differed in their bayesian information criterion values by at least 2 points were considered to have meaningful differences in their data fit (Raftery, 1996). If more than one model had adequate fit, then the average requirement estimate was used. The requirements presented are an average of the requirement for ADG and F/G. Requirements estimates for boars were based on relative differences from barrows published by Bertram et al., (2014) and NRC (2012).

Due to the high potential for protein deposition, adequate amino acid supply is important for successful production of PIC pigs. Amino acid deficient diets can have negative influences on growth performance and behavior (Fraser et al., 1991; NRC, 2012).

Figure 1 shows the relative changes in Lys requirement from 2008 versus 2016 meta-analyses in a corn-soybean meal based diet. Figure 2 shows Lys requirement for barrows, gilts, and boars in a metabolizable energy (ME) basis. Finally, the Lys to calorie ratio equations for gilts, barrows, and boars are presented in imperial and metric unit systems in Tables 1 and 2, respectively.

Tools available for download:

- [Lysine biological requirement for PIC pigs under different weight ranges](#)
- [Lysine economic calculator for PIC pigs](#)

Feel free to download the new PIC nutrition manual in [English \(imperial\)](#), or [English \(metric\)](#).

In conclusion, lysine requirements for PIC pigs are virtually the same as in the past on a grams of lysine per unit of gain basis. However, they are greater on a dietary concentration basis due to increasing rates of growth and efficiency associated with selection progress.



PIC lysine requirement update (cont.)

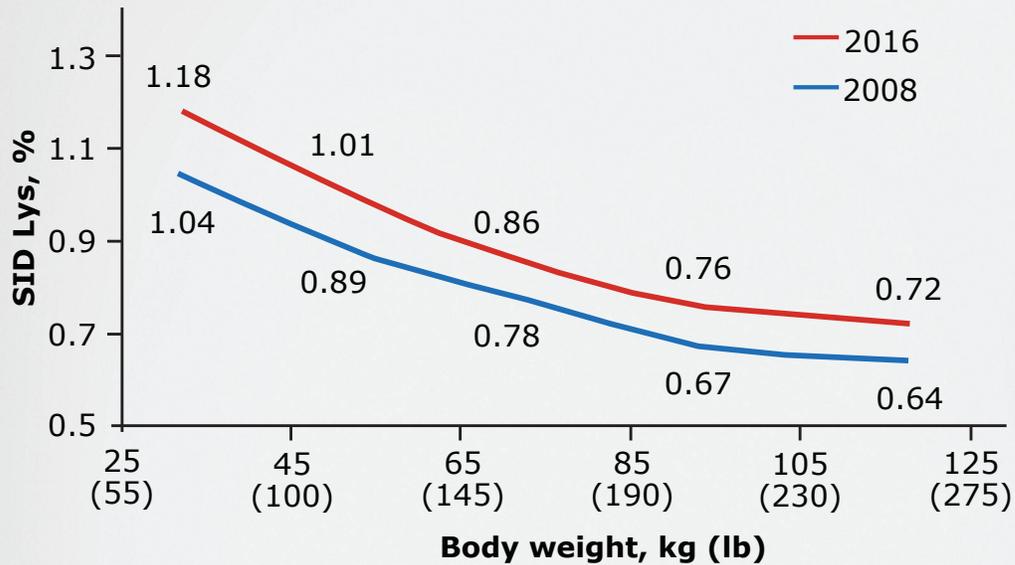


Figure 1. Example of standardized ileal digestible (SID) Lysine (Lys) for PIC finishing pigs from 2008 and 2016 meta-analyses for a corn/soybean meal based diet (average of barrows and gilts) with 3.31 Mcal ME/kg (2.44 Mcal NE/kg).

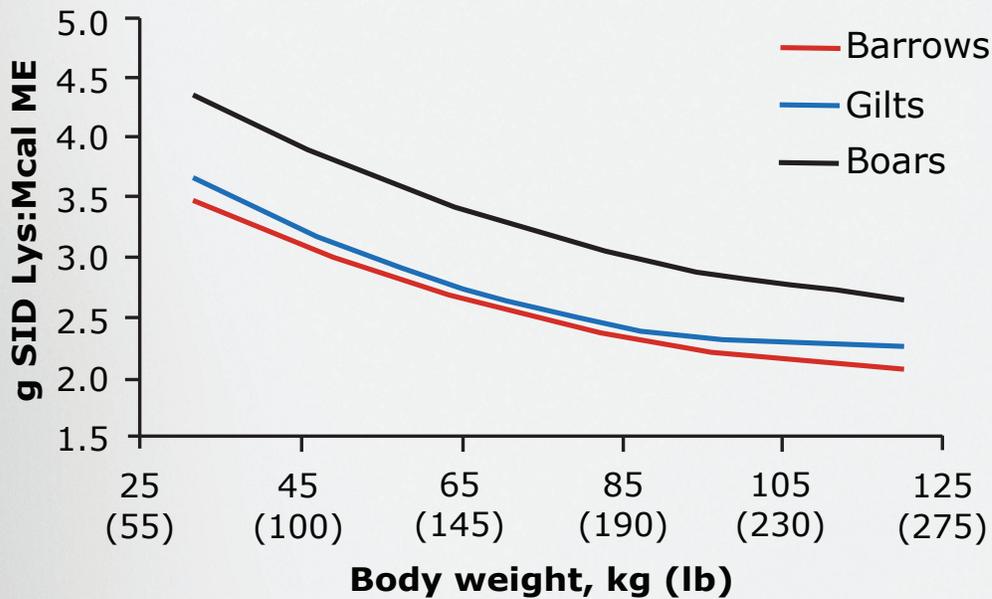


Figure 2. Standardized Ileal Digestible (SID) Lysine (Lys) to net energy (NE) ratio for different body weight and gender.



PIC lysine requirement update (cont.)

Table 1. Standardized Ileal Digestible (SID) Lysine (Lys) to metabolizable (ME) and net energy (NE) ratio equations for PIC pigs^{a,b,c} (imperial version)

Gilts		
SID Lysine:Calorie ME	=	0.000043 x body weight, lb ² - 0.02154 x body weight, lb + 4.9538
SID Lysine:Calorie NE	=	0.000056 x body weight, lb ² - 0.02844 x body weight, lb + 6.6391
Barrows		
SID Lysine:Calorie ME	=	0.000031 x body weight, lb ² - 0.0176 x body weight, lb + 4.5523
SID Lysine:Calorie NE	=	0.000042 x body weight, lb ² - 0.02372 x body weight, lb + 6.1452
Boars		
SID Lysine:Calorie ME	=	0.000034 x body weight, lb ² - 0.02007 x body weight, lb + 5.5870
SID Lysine:Calorie NE	=	0.000046 x body weight, lb ² - 0.02704 x body weight, lb + 7.5417

^aThese specifications should be used as a guide. They require adjustment for feed intake, local conditions, and markets.

^bLysine specifications are based on a series of 27 trials conducted under commercial research conditions. (9 of them in partnership with JBS United).

These equations are only valid for pigs from 23 to 135 kg BW.

^cRequirements estimates for boars were based on relative differences from barrows published by Bertram et al., (2014) and NRC (2012).

Table 2. Standardized Ileal Digestible (SID) Lysine (Lys) to metabolizable (ME) and net energy (NE) ratio equations for PIC pigs^{a,b,c} (metric version)

Gilts		
SID Lysine:Calorie ME	=	0.000043 x (body weight, kg x 2.2046) ² - 0.02154 x (body weight, kg x 2.2046) + 4.9538
SID Lysine:Calorie NE	=	0.000056 x (body weight, kg x 2.2046) ² - 0.02844 x (body weight, kg x 2.2046) + 6.6391
Barrows		
SID Lysine:Calorie ME	=	0.000031 x (body weight, kg x 2.2046) ² - 0.0176 x (body weight, kg x 2.2046) + 4.5523
SID Lysine:Calorie NE	=	0.000042 x (body weight, kg x 2.2046) ² - 0.02372 x (body weight, kg x 2.2046) + 6.1452
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References

Bertram, M., Tokach, M., Pollmann, S., Nelson, D. 2014. Nutritional Guidelines for Immunologically Castrated Male Pigs. Technical bulletin Zoetis. p. 8.

Fraser, D., Bernon, D.E. and Ball, R.O., 1991. Enhanced attraction to blood by pigs with inadequate dietary protein supplementation. Can. J. Anim. Sci., 71:611-619.

Gonçalves, M. A. D., N. M. Bello, S. S. Dritz, M. D. Tokach, J. M. DeRouchey, J. C. Woodworth, and R. D. Goodband. 2016. An update on modeling dose–response relationships: Accounting for correlated data structure and heterogeneous error variance in linear and nonlinear mixed models. J. Anim. Sci. 94: 1940-1950.

NRC. 2012. Nutrient requirements of swine: 11th revised edition. Natl. Acad. Press, Washington, DC.

Raftery, A. E. 1996. Approximate bayes factors and accounting for model uncertainty in generalized linear regression models. Biometrika 83:251–66.