Effects of Feeding EcoCare® Feed on Nitrogen and Phosphorus Mass Balance During the Entire Finishing Period

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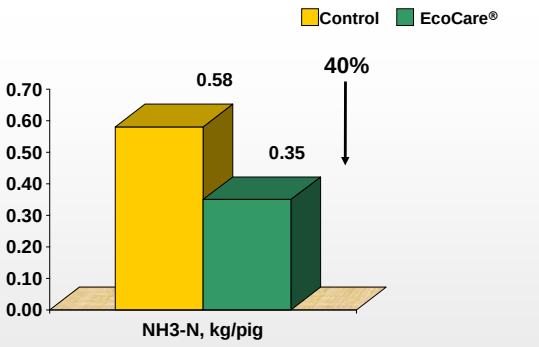
This technical bulletin is intended to summarize the effects of feeding EcoCare® Feed on nitrogen (N) and phosphorus (P) mass balance during an entire finishing period. The study was conducted at the Swine Education and Research Center at Oklahoma State University, and the results were presented at the 2009 American Society of Animal Science Midwest Meeting (Walraven *et al*., 2009).

This N and P mass balance study provides a comprehensive description of the origin and fate of N and P in association with a swine finishing operation. The study used 80 crossbred (D x (L x Y)) pigs (59 lb BW) during a 122-d finishing period, housed in an environmentally-controlled building with 4 identical rooms (20 pigs/room, 2 rooms/trt), Each room contained a shallow pit, pull plug system. Pigs in two rooms were fed corn-soybean meal-based diet as the control, and pigs in the other two rooms were fed EcoCare® Feed.

The mass balance was estimated on a per pig basis, assuming that N and P entered the finisher via the feed and the feeder pigs, and exited via the manure, exhaust air, and market pigs. Feed intake and composition were used to estimate the amount of N and P entering via feed. To estimate N and P entering via the feeder pigs, 6 pigs were removed at day 0 for determination of initial body composition. To estimate the amount of N and P exiting via the market pigs, 6 pigs per room were removed at the end of the finishing phase (24 pigs total at day 110 [12 pigs per treatment]) for determination of the market pigs body composition. The amount of N and P exiting the finisher via manure was estimated using weekly measurements of manure volume and analyzed N and P concentration in each week manure sample. The amount of N exiting the finisher in exhaust air was estimated by measured ammonia emissions. Thus, manure volume and composition, in addition to ammonia emission were used to estimate N and P leaving the finisher barn as waste.



1 kg = 2.2 lb; 1 lb = 454.6 g

Figure 1. Nutrients Exiting Ammonia (NH_3-N) Emission

The summarized ammonia emission data is presented in Figure 1. **Note that by feeding EcoCare® Feed, ammonia emission was reduced by 40%.**

This reduction in ammonia emission is associated with the use of crystalline amino acids, in addition to the EcoCare® manure technologies.

The N and P mass balance are presented in Tables 1 and 2.

Table 1. Mass Balance for Nitrogen

	Control	EcoCare®
Total **N Entering, kg/pig**	**8.07**[a]	**6.95**[b]
Feeder pig N , kg/pig	0.64	0.64
Feed N , kg/pig	7.43[a]	6.31[b]
Total N Exiting, kg/pig	**8.15**[a]	**6.86**[b]
Market pig N , kg/pig	3.42	3.44
Manure N , kg/pig	4.16[a]	3.07[b]
Ammonia N, kg/pig	0.58[a]	0.35[b]
N Mass Balance, kg/pig	**-0.08**	**0.09**

Walraven et al., 2009

[a,b]**P < 0.05**

1 kg = 2.2 lb; 1 lb = 454.6 g

Table 2. Mass Balance for Phosphorus

	Control	EcoCare®
Total P Entering, kg/pig	**1.75**[a]	**1.40**[b]
Feeder pig P, kg/pig	0.11	0.11
Feed P, kg/pig	1.64[a]	1.28[b]
Total P Exiting, kg/pig	**1.74**[a]	**1.40**[b]
Market pig P, kg/pig	0.713	0.720
Manure P, kg/pig	1.02[a]	0.68[b]
P Mass Balance, kg/pig	**0.01**	**0.0**

Walraven et al., 2009

[a,b]**P < 0.05**

1 kg = 2.2 lb; 1 lb = 454.6 g

Under ideal conditions, when total nutrients entering and exiting are successfully measured, the value of a perfect mass balance is zero. In this study, the N and P mass balance for both treatments were very close to zero indicating that total nutrients entering and exiting the production system were successfully measured in this study.

For the N mass balance (Table 1), the total N entering into the finisher was reduced when pigs were fed EcoCare® Feed. **The reduction in N entering the finisher resulted in the reduction of N leaving in waste.**

Similarly, for the P mass balance estimation (Table 2), the amount of P entering the finisher was reduced when pigs were fed EcoCare® Feed. The reduction in P entering the finisher is associated with adjusted P concentration and constant phytase delivery in EcoCare® Feed**. The reduction in dietary P resulted in the decrease of the amount of P leaving in the manure.**

This reduction in N and P entering the finisher due to feeding EcoCare® Feed is associated with reducing the amount of N and P leaving as waste, without affecting the amount of these nutrients needed and kept by the market pig.

In summary, this study indicates that by feeding EcoCare® Feed during a 122-d finishing period:

- ammonia emission was reduced by 40%
- daily and cumulative N excretion was reduced by 26%
- daily and cumulative P excretion was reduced by 32%

without affecting the amount of N and P leaving the finisher via the market pig.

Reference

Walraven, T., S.D. Carter, M. Lachmann, J. Bundy, J. Jarrett, and B. De Rodas. 2009. Effects of EcoCare® Feed on the mass balance of N and P during the swine finishing phase. J. Anim. Sci 87(E-Suppl. 3):51.

For further information on EcoCare® Feed, please see your local feed sales representative at a Land O'Lakes Feed Co-op or Purina Mills Dealer. Visit us on-line at www.LOLFeed.com, www.PurinaMills.com,

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