New Phytase Effective In Improving Phosphorus, Calcium Digestibility In Pigs

URBANA, ILL.

Phosphorus is a vital nutrient for pig growth, but the majority of the phosphorus in common plant-based feedstuffs is bound to phytate and therefore is unavailable to pigs. Diets fed to pigs can be supplemented with microbial phytase to improve phosphorus digestibility, according to Hans S. Stein, a University of Illinois professor in animal sciences.

Stein and his team at the U of I have recently published results indicating that a new microbial phytase derived from the bacterium Aspergillus oryzae is highly effective at releasing phosphorus from the phytate molecule.

"There are many microbial phytases on the market, and companies are constantly developing new ones to try to release more phosphorus from the phytate molecule," Stein said. "Some are E. coli based, and some are based on other microbes. This particular enzyme is based on Aspergillus oryzae, and this is the first time we have worked with it."

In the study, pigs were fed diets based on corn and soybean meal. The positive control diet had dicalcium phosphate and limestone added. The negative control diet contained no microbial phytase and no dicalcium phosphate, and experimental diets were formulated by adding 500, 1,000, 2,000, or 4,000 phytase units, respectively, to the negative control diet. Two experiments were conducted: one using weanling pigs (average initial body weight: 13.5 kg) and one using growing pigs (average initial body weight: 36.2 kg).

Stein explained that when the negative control diet was fed to weanling pigs, the apparent total-tract digestibility (ATTD) of phosphorus was 40.5 percent. The ATTD of phosphorus increased as phytase was added to the diet, to a maximum of 68.7 percent. A broken line analysis was then performed to determine the optimal phytase level. The breakpoint was at 1,016 phytase untis, with an ATTD of 68.4 percent. This compared favorably to the ATTD of phosphorus in the positive control diet, which was 60.5 percent. For growing pigs, the ATTD of phytase was 39.8 percent for the negative control diet, 59.4 percent for the positive control diet, 72.8 percent at 4,000 phytase units, and 69.1 percent at the breakpoint level of 801 phytase units.

Calcium digestibility was also improved by adding microbial phytase to the negative control diet, he said. In weanling pigs, the ATTD of calcium increased from 63.9 percent in the negative control to 84.7 percent at the optimal phytase level of 1,155 phytase units. In growing pigs, the ATTD of calcium increased from 67.3 percent in the negative control to 83.5 percent at the optimal phytase level of 574 phytase units.

"Because we did not compare this phytase to other microbial phytases, we cannot say whether or not this is as good as or better than some of the other commercial phytases, but this is a very effective phytase," Stein added.

The new Aspergillus oryzae-based phytase, Ronozyme HiPhos, is produced in Denmark,

and has been approved for use in Europe and the United States, where it is marketed by DSM Nutritional Products.

The study, "Effects of a novel bacterial phytase expressed in Aspergillus oryzae on digestibility of calcium and phosphorus in diets fed to weanling or growing pigs," was published in the Journal of Animal Science and Biotechnology and is available online at http://www.jasbsci.com/content/4/1/8. Ferdinando Almeida, a Ph. D. candidate in the Stein Monogastric Nutrition Laboratory at Illinois, and Rommel Sulabo of the National University of the Philippines were co-authors of the study. Δ