

Akey's Philosophy on Validating Enzyme Product Efficacy

As ingredient prices increase, more and more emphasis is being placed on minimizing feed costs while improving or maintaining feed efficiency. Since energy is the most expensive nutrient in feed, considerable effort has been placed on reducing energy cost by either lowering dietary energy density or improving energy utilization. As discussed in Akey's previous *Akey Swine Newsletter* (November 2008), non-starch polysaccharides (NSP) are complex carbohydrates found in feed ingredients which remain undigested through the small intestine of pigs. To make use of NSP prior to the large intestine, dietary enzymes specific to NSP can be added to the diet. Several enzymes currently on the market claim to release energy from dietary NSP. If we know how much energy is released when we use an NSP enzyme, we can place an energy specification on the enzyme and let it least cost into the diet. If the cost of the enzyme and the energy it releases is cheaper than adding fat to the diet, the enzyme will least cost into the formula. This process allows diets to be formulated on an equal energy basis but at a lower cost. This approach is used by Akey with phytase. We give the phytase enzyme an available phosphorus (P) specification (rather than energy) and remove monocalcium phosphate (rather than fat) from the diet. This allows diets to be formulated on an equivalent available P level, but at a lower diet cost.

Before nutrient release values can be assigned to an enzyme product, efficacy trials must be conducted. We need to validate release values for different enzyme levels in response to a chosen variable, such as feed conversion or digestibility of a particular nutrient. Figure 1 displays a common curve for digestible P released in response to increasing levels of phytase. The P release value assigned to 454 FTU/lb of phytase is equal to the improvement in digestible P compared to the diet without phytase. This release value is then used for phytase during formulation in order to determine how much rock phosphate the phytase can replace.

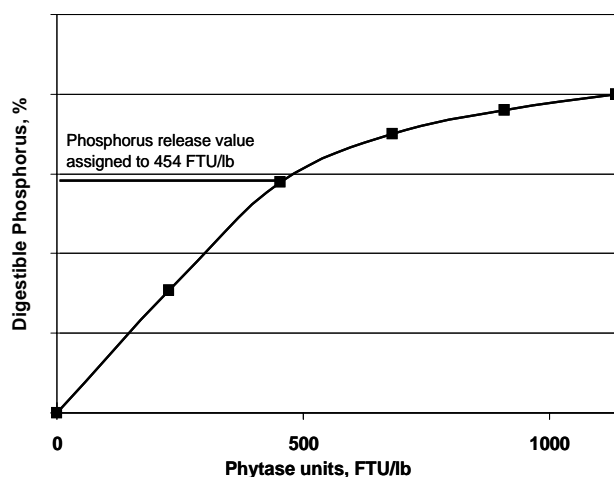


Figure 1. The effect of increasing dietary phytase level on digestible P content of the diet in 25-50 lb pigs. As the level of dietary phytase increases, the digestible P content increases due the utilization of phytate-P in the dietary ingredients.

Akey has taken a similar approach with NSP enzymes in respect to digestible energy and feed efficiency. If an NSP enzyme is releasing energy, there should be a measurable improvement in digestible energy (DE = energy in feces minus energy in feed). In addition, if there is an improvement in DE, there should be an improvement in feed efficiency. The improvement in either DE or feed efficiency over the low energy diet with no enzyme would be the energy release value assigned to the enzyme. This value would then be used to determine how much fat or other energy source could be replaced upon addition of the enzyme. Using this approach, efficacy of the enzyme in a low energy diet is proved first, followed by determination of the proper energy release value.

Over the last 10 years, Akey has conducted more than 25 trials with NSP enzymes varying in type from pure xylanase to enzyme cocktails containing mixtures of amylase, xylanase, and beta-glucanase. Some of our more recent data was summarized in our last edition of the *Akey Swine Newsletter* (November 2008). We have failed to show a consistent improvement in either DE (Figure 2) or feed efficiency (Figure 3) when supplementing low energy diets with NSP enzymes. Our research indicates that NSP enzymes are not effective in releasing energy that can be used by pigs to improve performance. Thus, unless specifically requested to do so by a customer, we do not give an energy release value to NSP enzymes when formulating swine diets.

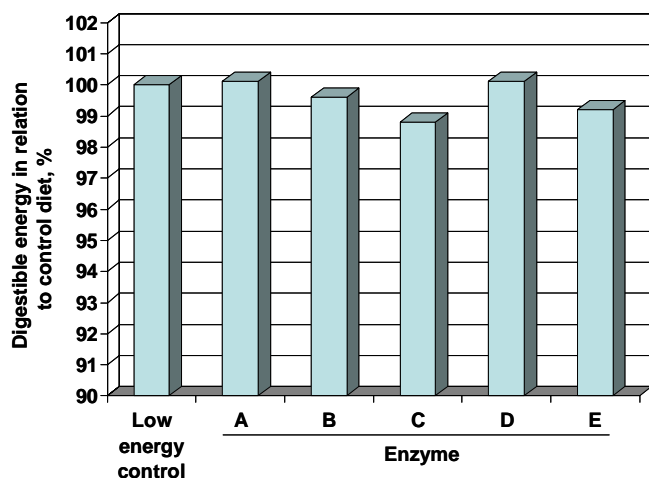


Figure 2. The effect of supplementing NSP enzymes in low energy wheat based diets on DE in 25-50 lb pigs. The control diet was assigned a value of 100% and all other treatments are reported in relation to the control ($P>0.10$).

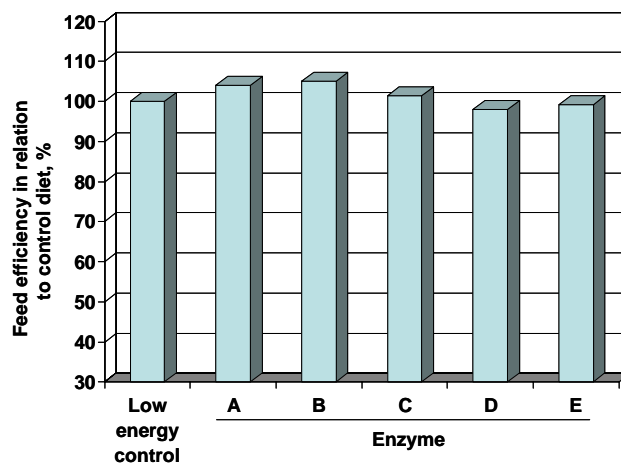


Figure 3. The effect of supplementing NSP enzymes in low energy wheat based diets on feed efficiency in 25-50 lb pigs. The control diet was assigned a value of 100% and all other treatments are reported in relation to the control ($P>0.10$).

Energy release values are frequently provided for enzymes by the manufacturers along with research showing equivalent performance between a high energy diet and a diet with enzymes replacing fat at a lower final diet cost. However, in order to assign a proper release value to an enzyme, it is necessary to demonstrate improved performance over a low energy diet with no enzyme. It is quite possible to feed pigs diets slightly lower in energy without detecting a reduction in feed efficiency even in the absence of NSP enzymes. If diet costs are lowered by reducing fat inclusion and adding an enzyme, it is likely that reducing fat the same percentage and not including the enzyme would result in equivalent performance at an even lower diet cost.

Akey is a strong proponent of phytase usage in swine feeds and has been aggressively using phytase for more than 15 years. However, Akey's philosophy for including any feed additive is to first verify the product changes an economically important variable and then assign a nutrient release value. Akey has conducted many trials proving the ability of phytase to release P from phytate. We have assigned P release values to phytase using improvements repeatedly quantified in P digestibility trials. Since we have not been able to show an improvement in digestible energy or feed efficiency in more than 15 tested NSP enzymes, we have not assigned energy release values to these products. We continue to test the efficacy of new NSP enzymes as they enter the marketplace so we can keep our customers on the leading edge of enzyme research.