

**SWINE SPECIES: MINI-SYMPOSIUM:  
OPPORTUNITIES AND CHALLENGES  
WITH THE USE OF CARBOHYDRASE  
AND PROTEASE ENZYMES IN  
SWINE FORMULATIONS**

**0741 Opportunities and challenges with the use of carbohydrase and protease enzymes in swine formulations.** R. T. Zijlstra\*<sup>1</sup>, T. A. Woyengo<sup>1</sup>, Z. Nasir<sup>1</sup>, and E. Beltranena<sup>1,2</sup>, <sup>1</sup>*University of Alberta, Edmonton, Canada,* <sup>2</sup>*Alberta Agriculture and Rural Development, Edmonton, Canada.*

Co-products from crops processed for the food, biofuel, or bio-industry are attractive feed ingredients to manage feed costs per unit of gain in pigs. Compared with crops from which they are derived, alternative feed ingredients may contain more anti-nutritional factors such as phytate, fiber, and indigestible proteins that may limit nutrient digestibility. Together with feed processing technologies and advanced feed quality evaluation techniques, supplemental feed enzymes are important parts of a strategy to mitigate the risks associated with high dietary inclusion of co-products and reduce feed cost per unit of gain. Supplementation of feed enzymes to cereal-based diets

has been studied. Recently, feed enzyme technology has been applied to co-products. Among feed enzymes, phytase inclusion has one of the most consistent effects on increased nutrient digestibility, especially for P. For fiber-degrading enzymes (carbohydrases) and proteases, some important considerations are: 1) the substrate for the enzyme must be the main limitation for digestibility of the nutrient of interest, 2) processing technology may affect the content and functional characteristics of fiber in the co-product, and 3) age and thus gut development may affect responses to enzyme supplementation. Generally, carbohydrases increase energy digestibility, but their effects on AA and P digestibility are variable depending on trial conditions. Protease enzymes appear to have less consistent effects on nutrient digestibility in grower pigs. Due to the alterations made in nutrient flow through the intestinal tract, supplemental enzymes may also alter nutrient availability to intestinal microbes, and hence alter microbial populations. Thus apart from opportunities, a major challenge for using carbohydrases and proteases is to obtain effects as consistent as observed for phytase. If solved, application of enzyme technology combined with modern feed processing and feed quality evaluation technologies may then provide the pig with additional energy, AA, and P resulting in cost-effective, predictable growth performance and carcass quality.

**Key Words:** enzyme, feed ingredient, pig