ENZYMES: Alternative solutions for AGP free poultry production

As the industry's search for the most effective alternatives to in-feed antibiotics continues, one thing seems clear, promoting positive gut health in the animal is essential to achieving optimal cost and performance. Gut health, described by Stephan Bischoff, is a balancing act that involves achieving homeostasis in interactions between the animal's gut microbiome, immune function and nutritive processes.

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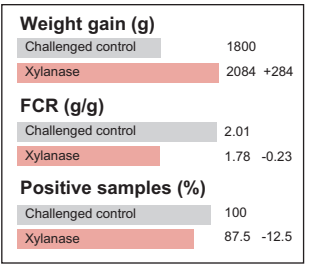
Can enzymes be part of the solution?

An increasing number of trials demonstrate the impact nutrition has on the animal's gut health and performance. Enzymes are a key nutritional consideration and player in these effects. Exogenous enzymes are categorised according to the substrates they target, exogenous xylanases target the soluble and insoluble arabinoxylans in cell walls. Use of xylanase has multiple benefits, from releasing encapsulated nutrients such as starch and protein from the cells to reducing the viscosity of the digesta, both leading to improvements in digestibility (Choct, 2006). Non-starch polysaccharide (NSP) content in animal feed is one variable needing to be managed as it affects satiety, gut motility, nutrient digestion and absorption, as well as changes in gut microbiota. The breakdown of NSPs by xylanase can create a positive environment for beneficial bacteria to grow by reducing viscosity and producing small oligomers. Recent scientific studies shed light on enzymes' effectiveness in maintaining a stable gut environment by favouring host and beneficial microflora and creating specific conditions detrimental to the growth of non-beneficial bacteria.

The mechanism of action behind the effectiveness of enzymes differ in the upper and lower gastrointestinal tract (GIT). In the upper GIT, exogenous enzymes increase the digestibility of nutrients, leading to a reduction in the availability of indigestible substrate for microbial growth. Furthermore, viscosity of the chyme is also reduced when feeding viscous grains such as wheat or barley, increasing the passage rate of digesta. These conditions lead to a reduced microbial population in the upper GIT, consequently reducing the threat of proliferation of non-beneficial bacteria. While degrading viscous β-glucans and arabinoxylans from wheat and barley, small oligomers and free sugars are produced and some of these are poorly absorbed in the upper intestinal tract.

These oligomers and sugars are utilised by certain beneficial bacteria in the hind gut leading to increased volatile fatty acids (VFA) production and containment of proliferation of non-beneficial bacteria. Choct et al (1999) found that VFA production was lower in an enzyme treated group in the ileum, while in contrast in the caecum VFA production of the enzyme treated group was higher than the control. These results underline the earlier mentioned degradation of fibre fractions into smaller oligomers and sugars which are fermented further down the tract in caecum. This shift can benefit intestinal health and microbial balance in the lower GIT.

These effects were evident in several published studies, showing higher performance of the animals along with reduction of non-beneficial bacteria in the GIT. Amerah et al (2012), showed a significant reduction in Salmonella prevalence in broilers, when xylanase was added to the diet. Some studies also reported positive effects of xylanase inclusion on gut barrier function when birds were challenged by C. perfringens (Liu et al 2012).



Enzymes are known for their effects on the anti-nutritional factors in the feed, however, their impact on the gut environment, and consequently on gut health is receiving growing attention. The ability of enzymes to boost animal performance, reduce feed cost and positively affect the gut environment and health, support their use as an important feed additive in the post-AGP era.

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