

Editorial

Xylanase Supplementation in Wheat-based Diets and the Influence on Necrotic Enteritis in Broilers: A Translational Model for Human Malnutrition

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Article information

Received: October 7th, 2018; **Accepted:** October 11th, 2018; **Published:** October 16th, 2018

Cite this article

Beer L, et al. Xylanase supplementation in wheat-based diets and the influence on necrotic enteritis in broilers: A translational model for human malnutrition. *Adv Food Technol Nutr Sci Open J.* 2018; 4(2): e4-e5. doi: [10.17140/AFTNSOJ-4-e013](https://doi.org/10.17140/AFTNSOJ-4-e013)

In the poultry industry, necrotic enteritis results in substantial production and economic losses each year. Outbreaks are more prevalent due to the removal of antibiotic growth promoters.¹ *Clostridium perfringens*, a commensal organism within the gastrointestinal tract of poultry, is the primary bacterial etiology responsible for necrotic enteritis.² In the absence of a host, *C. perfringens* spores can remain dormant in the environment for long durations, possibly between flocks.³ *Eimeria* spp. colonization commonly predisposes broilers to the disease due to epithelial cell damage and increased mucus production, which provides an ideal environment for proliferation of *C. perfringens*.⁴ Dietary ingredients, such as wheat can affect the integrity of the gastrointestinal tract and potentially induce necrotic enteritis.^{2,5}

Wheat is a variable feed grain that is high in insoluble non-starch polysaccharides.⁶ Non-starch polysaccharides fed in moderate amounts can slow passage rates due to the gizzard's ability to retain insoluble fiber.⁷ High-levels of non-starch polysaccharides present in wheat diets can increase viscosity in the small intestine due to their lack of digestibility.⁶ According to Branton et al broilers challenged with *C. perfringens* and fed wheat-based diets had higher necrotic enteritis lesion scores than the challenged and non-challenged corn-based diet controls.⁵

Research studies have shown that enzyme addition to broiler diets can mitigate the negative effects of necrotic enteritis and improve growth performance.⁸ Moreover, xylanase supplementation to poultry diets is widely accepted as this enzyme functions to break down arabinoxylans located within plant cell walls, producing greater nutrient bioavailability and reducing negative non-starch polysaccharides.⁶ Within wheat-based broiler diets, supplementation of xylanase has been shown to increase

apparent metabolizable energy, improve ileal nutrient digestibility, decrease ileal digesta viscosity, reduce feed conversion ratio, and diminish levels of *C. perfringens*.^{9,10,11} Additionally, xylanase supplementation to wheat-based diets may alleviate damage inflicted by necrotic enteritis upon the intestinal mucosal barrier partly through protective mechanisms which contribute to the reduction of apoptotic epithelial cells and intestinal permeability.¹² Taken together, these results indicate the positive impacts that the inclusion of enzymes such as xylanase appear to have upon the growth performance of broilers, leading to a potentially significant economical contribution.

The utilization of xylanase within animal feed for improved growth performance suggests a potential area of nutritional improvement through poultry production as an efficient protein source to feed the future. Furthermore, xylanase is a naturally-occurring enzyme that can have beneficial impacts on human health and digestion through the degradation of fiber, although humans are unable to synthesize xylanase and must rely on microorganisms. Additionally, xylanases might offer some benefit within the food industry, particularly for the acceleration of bakery products.¹³ Therefore, the use of supplemental xylanase can be potentially beneficial, especially in malnourished countries, to support the breakdown of fiber and further utilization of previously inaccessible nutrients. Xylanase has been extensively used in the baking industry leading to an increase in bread volumes, greater absorption of water, and improved resistance to fermentation.^{14,15} Additionally, the fiber-breaking enzymes are capable of hydrolyzing the non-digestible carbohydrates that bind and compromise fiber utilization. Therefore, xylanase can be a digestive aid to improve the nutritional value and digestion of fibrous foods.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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