International Journal of Science, Environment and Technology, Vol. 6, No 1, 2017, 254 – 259

ISSN 2278-3687 (O)
2277-663X (P)

Review Article

REVIEW: NATURAL GROWTH PROMOTERS, ALTERNATIVE TO ANTIBIOTIC GROWTH PROMOTERS ON POULTRY

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Abstract: The use of sub therapeutic levels of antibiotics in poultry feed improves performance and morbidity in poultry. However, the growing concern over then transmission and the proliferation of resistant bacteria in human via the food chain has led to a ban of Antibiotic Growth Promoters (AGP) in livestock feed within the European Union since, 2006. As a result, new commercial additives derived from nature have been examined as part of alternative feed strategies for the future. Such products have several advantages over commonly used commercial antibiotics and recognized as safe items in the food industry. Certain natural alternatives recognized by scientific community as Natural Growth Promoters to preserve and maintain the balance of gut micro biota in poultry. This review provides a summary of the potentials and possible mechanisms of action of some alternatives to AGP in improving the gut microbial ecosystem and immune system as well as growth performance of poultry.

Keywords: Growth Promoters, Antibiotics, Poultry, Probiotic.

Introduction

The act of feeding antibiotics to livestock has been practiced for over fifty years (Choe *et al*., 2013). The mode of action of antibiotics is that they alter microbial metabolism thereby suppressing the growth of pathogenic microbes in the gut (Gadd *et al*., 1997). The use of antibiotics has been criticized for having negative impacts on animal production and health as it could have residual effects on tissues long after withdrawal. The usage of antibiotics as feed additives for long periods in poultry diets lead to antibiotic resistance (Shazali *et al*., 2014) and high residue levels in poultry products such as meat and egg (Olatoye *et al*., 2010), therefore, the poultry industry in this area is now facing a great challenge to maintain production performance of birds due to increased feed costs and the restriction of antimicrobial use in feeds. On the other hand, the consumers are very conscious regarding this issue, and thus it is a growing concern for academics and feed industry nutritionists to

*Received Dec 24, 2016 * Published Feb 2, 2017 * www.ijset.net*

find suitable alternatives to AGP to ensure the safety of animal products (Smith *et al*., 2002). Interest and some useful research on various Natural Growth Promoters (NGPs) such as phytobiotics, probiotics, prebiotics, synbiotics, organic acid, clay minerals, exogenous enzymes and nucleotides has increased the impetus for revisiting to look for new, useful additives that can enhance gut health and productivity of birds.

Characteristics of Natural growth promoter

AGPs have an antibacterial action that favors performance of broilers in different ways (Botlhoko, 2009). A good AGP alternative should be capable of reducing the incidence and severity of subclinical intestinal infections of broilers by reducing the microbial use of nutrients (Bray, 2008) and improving absorption because of thinning of the intestinal wall (Mroz, 2005).

Probiotics

Probiotics are defined as direct-fed mono or mixed cultures of live microorganism, which when administered in adequate amounts confer a healthy benefit on the host by improving the properties of the indigenous micro flora (Botlhoko, 2009). Probiotics are single or mixed culture of living microorganisms which when administrated in adequate numbers exert health benefits for the host by improving the host intestinal microbial balance, enhancing of colonization resistance against pathogens and improving the immune responses (Das *et al*., 2012). The species of microorganisms currently being used in probiotic preparations are varied, and LAB, i.e., *Lactobacillus bulgaricus*, *Lactobacillus acidophilus*, *Lactobacillus casei*, *Lactobacillus lactis*, *Lactobacillus salivarius*, *Lactobacillus plantarum*, *Streptococcus thermophilus*, *Enterococcus faecium*, *Enterococcus faecalis*, *Bifidobacterium* spp., are the most common type of bacteria used as probiotics (Kabir, 2009).

Prebiotics

Prebiotics are non digestible feed ingredients that beneficially affect the host by selectively altering the composition and metabolism of the gut micro biota (Huyghebaert *et al*., 2011 and Das *et al*., 2012). Prebiotics may provide energy for the growth of endogenous favorable bacteria in the gut, such as bifidobacteria and lactobacilli, thus improving the host microbial balance (Das *et al*., 2012). The increased production of small chain fatty acids with administration of prebiotics resulting in increased intestinal acidity may also contribute to the suppression of pathogens in the gut of chicken. Prebiotics have also been reported to enhance the immune response of chicken, resulting in rapid clearance of pathogens from the gut. The

most often used prebiotics are fructo-oligosaccharides (FOS), inulin, galacto oligosaccharides (GOS), xylo-oligosaccharides (XOS), pyrodextrins, and lactulose (Alloui *et al*., 2013).

Symbiotic

Both probiotic and prebiotic are combined, they form symbiotic (Huyghebaert *et al*., 2011). This combination could improve the survival and persistence of the health-promoting organism in the gut of birds because its specific substrate is available for fermentation (Adil and Magray, 2012). The functional benefits of symbiotic, such as resistance to gastrointestinal bacterial infection, antimicrobial activity, and improvement of immune system are envisaged in the development of symbiotic products (Saminathan *et al*., 2011).

Exogenous enzymes

Various exogenous enzymes including b-glucanase, xylanase, amylase, a-galactosidase, protease, lipase, phytase, etc. have been supplemented in poultry diets for decades (Bedford and Cowieson, 2012). The effects of enzymes on gut microflora are classified into two phases: an ileal phase and a caecal phase. In the ileum, enzymes simply reduce the number of bacteria by increasing the rate of digestion and limiting the amounts of substrates available to the microflora. While, in the caecal phase enzymes produce soluble, poorly absorbed sugars which feed beneficial bacteria, however the effects of enzymes on the gut microflora are far more than those two phases (Bedford and Cowieson, 2011).

Organic acid

Organic acids, such as lactic, acetic, tannic, fumaric, propionic, caprylic acids, etc., have been shown to exhibit beneficial effects on the intestinal health and performance of birds (Saki *et al*., 2012). Saki *et al*. (2012) reported that supplementation of organic acids in the diet increased LAB counts in the ileum and caecum of broiler chicken. Organic acids reduce pH value of feed and in this way act as conserving agents and prevent microbiological/microbial contamination of feed, a similar effect that is exhibited in the digestive tract of poultry (Gaggia *et al*., 2010).

Phytogene additives

Phytogenic additives influence improvement of consumption and conversion of food, digestibility and gain of broiler chickens (Peric *et al.,* 2009). The addition of herbs, oils, botanicals and spices in feed additives increases the secretion of digestive fluids and improves the immune system of broilers (Tollba, 2010). Despite the improved health, a better nutrient digestibility, reduced frequency of digestive disorders and also increased performance of broilers is ensured (Botlhoko, 2009).

Clay minerals

Clay minerals are natural clay formed by a net of stratified tetrahedral or octahedral layers and mainly composed by molecules of silicon, aluminum and oxygen (Vondruskova *et al*., 2010). Clays added to the diet can bind and immobilize toxic materials such as aflatoxins and heavy metals etc., may present in the gastrointestinal tract of chicken and thus, reduce toxicity (Owen *et al*., 2012). As a result of their binding properties, clay minerals have been widely used in poultry diets to improve chicken performance when diets are supposed to contain mycotoxins. Thacker (2013) reported that clay mineral exhibit beneficial effects on the intestinal health of chicken due to additional toxin binding action.

Nucleotides

Nucleotides are essential components of body involves in cellular metabolism and all intracellular biochemical processes such as, biosynthetic pathways, energy transfer system, as co-enzyme components and as well as biological regulators. Nucleotides changes the composition of intestinal micro flora that affect long-chain polyunsaturated fatty acids levels, as some bacteria's possess necessary enzymes for fatty acid elongation and denaturation and also promote intestinal absorption of iron by conversion of purine nucleotides (AMP, GMP) to inosine, hypoxanthine and uric acid which increase the absorption of iron (Cosgrove, 1998).

Conclusion

Alternatives for AGPs are only of practical significance when they improve animal performance at levels comparable to AGPs. Due to growing concerns about antibiotic resistance and the potential for a ban for antibiotic growth promoters, there is an increasing interest in finding alternatives to antibiotics in poultry production. The effects of probiotics, prebiotics, enzymes, organic acids, and phytogene additives on gut health and performance in poultry is currently researched and in use.

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