
Probiotics and its Use in Modern Poultry for Growth and Development

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Introduction

In modern intensive poultry production, normal flora is slow in colonizing the intestine of newly hatched chicks. Therefore, antibiotics are used to prevent diseases and improve growth performance. The use of antibiotics in poultry industry led to development of drug-resistant bacteria, drug residues in the body of the birds and imbalance of normal flora. All of the above led to banning of antibiotic use in poultry diets. One alternative of antibiotics is the use of probiotics. Probiotics are live microorganisms which, when administered in adequate amount, confer a health benefit on the host (FAO/WHO, 2002) and have beneficial effects on growth performance.

Probiotics should not be confused with *prebiotics*, which are typically complex carbohydrates (such as inulin and other fructo-oligosaccharides) that microorganisms in the gastrointestinal tract use as metabolic fuel. Commercial products containing both prebiotic sugars and probiotic organisms are often called “synbiotics.” Probiotics are live microbial food/feed ingredients that have a beneficial effect on health that stimulates the growth of beneficial microorganisms and reduces the amount of pathogens, thus improving the intestinal microbial balance of the host and lowering the risk of gastro-intestinal diseases. When supplemented to chicken probiotics improve feed-intake, growth performance, meat quality, egg production, egg quality and have cholesterol lowering potential in poultry products.

Features of good probiotics

- They should be a strain capable of exerting beneficial effects on the host animal.
- They should be non-pathogenic and non-toxic.
- They should be present as viable cells.
- They should be capable of surviving and metabolizing in the gut environment.
- They should be stable and capable of remaining viable for periods under storage and field conditions.

Importance of probiotics

- Probiotics are live microorganisms that exhibit several beneficial effects on animal health.
- These probiotics are usually incorporated in animal feed supplements or drinking water to prevent the growth of harmful bacteria in animals.
- Taking into account the growing awareness regarding animal nutrition and health.
- The global poultry probiotics market is slated to witness massive growth over the coming years.
- Poultry probiotics market size from Poultry & chick applications may witness gains at above 6 to 7 %.

- Chick & Poultry need these products to improve gut health and microflora which would improve their immune systems.
- Prolong exposure towards contaminated environment may cause infections in new born chickens.
- Global poultry probiotics market share is competitive and moderately consolidated.

Genera mostly used in probiotics

The seven core genera of microbial organisms most often used in probiotic products are *Lactobacillus*, *Bifidobacterium*, *Saccharomyces*, *Streptococcus*, *Enterococcus*, *Escherichia* and *Bacillus*. Multiple strains may be beneficial than single strain as they act on different sites and provide different modes of action that create synergistic effects.

Mode of action

The mode of action of probiotics in poultry is followings

- Maintaining normal intestinal micro flora by competitive exclusion and antagonism.
- Altering metabolism by increasing digestive enzyme activity and decreasing bacterial enzyme activity and ammonia production.
- Improving feed intake and digestion.
- Neutralizing enterotoxins and stimulating the immune system.

The most common mechanism of probiotics to work is

Competitive Exclusion (CE), which was originated on the finding that the newly hatched chicken could be protected against Salmonella colonization of the gut by providing it with a suspension of gut content prepared from healthy adult chickens. By competing for the common niche in the gut, probiotics exclude the sites for pathogen replication. CE refers to the physical blocking of opportunistic pathogen colonization and altering the environmental niches within the intestinal tract like intestinal villus and crypts leading to better immune system. CE due to probiotics includes competition for physical attachment sites, enhancement of host immune system and production of antimicrobial compound from metabolic reactions. Enhancement of the epithelial barrier, increased adhesion to intestinal mucosa, production of antimicrobial substances and modulation of immune system are other mechanisms of action by probiotics. A front line of defense against the adverse effect of pathogens is provided by probiotics showing its antimicrobial effect. It is also modulate the immune system mostly depend on the strains of bacteria or microorganisms used, probiotic preparation method, routes of administration and environment where birds are raised.

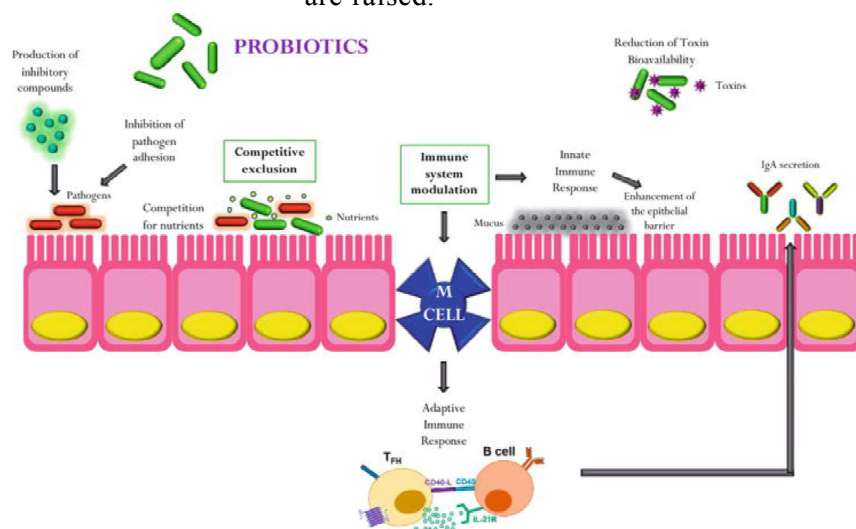


Figure No: 1- Mode of action of probiotics

Application of probiotic in modern poultry

Although probiotics are considered Potential alternatives to antibiotic use in poultry because they leave no residue in meat and eggs, their mode of action, the diversity of microorganisms in terms of species and even between strains of the same species, as well as metabolism. They may differ inactivity. Affect their effectiveness. In addition, other factors that affect the effectiveness of probiotics in poultry are the species of origin, method of probiotic preparation, the existence of colonizing microorganisms in the gastrointestinal tract conditions, the environment where the birds are raised, the use of probiotics Time of application and route of administration, immunological state, poultry lineage, as well as age and concomitant use of antibiotics.

Selection of probiotics

The desirable traits for selection of functional probiotics are must fulfill the

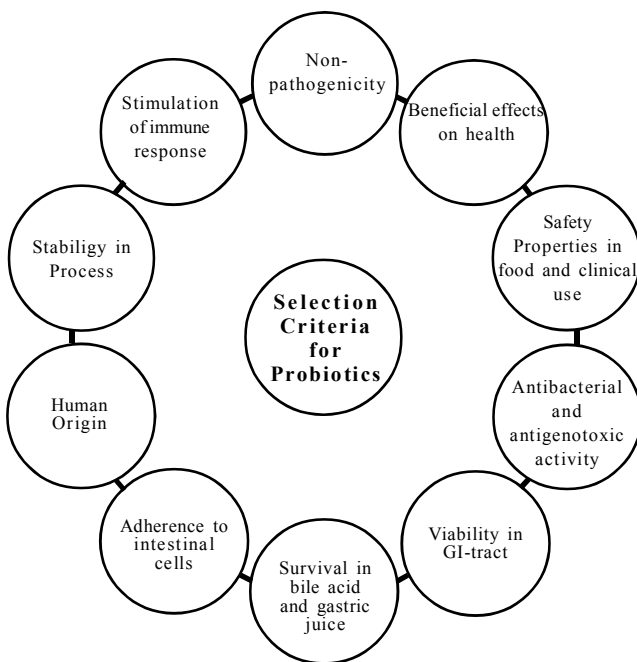


Figure No: 2 Selection of probiotics in modern poultry

following conditions, it must be a normal inhabitant of the gut, and it must be able to adhere to the intestinal epithelium to overcome potential hurdles, such as the low pH of the stomach, the presence of bile acids in the intestines, and the competition against other micro-organisms in the gastro-intestinal tract. The tentative ways for selection of probiotics as biocontrol agents in the poultry industry are illustrated in **Figure No: 2**. Many *in vitro* assays have been developed for the pre-selection of probiotic strains. The competitiveness of the most promising strains selected by *in vitro* assays was evaluated *in vivo* for monitoring of their persistence in chickens. In addition, potential probiotics must exert its beneficial effects (e.g., enhanced nutrition and increased immune response) in the host.

Effect of Probiotics on growth and immune response

The major effects observed in poultry due to probiotics including yeast cultures supplementation are in growth performance, meat quality, immune response, intestinal morphology, and intestinal microbiota. In poultry, the feeding of probiotics to maintain normal flora mainly improve feed consumption/digestion and gut health and stimulate the immune system. Probiotics may potentially stimulate growth through increased short-chain fatty acids (SCFA) production in poultry and through selective regulation of insulin signaling in different tissues Short chain fatty acids like acetate, propionate and butyrate are used as energy source in tissues. Another mechanism by which probiotics may stimulate

growth is by regulating the immune system. When immune system is regulated, it suppresses the negative effects of chronic immune activation. When immune system is activated, there is diversion of nutrients from production process towards immune response.

Improved health and production performance

Many beneficial effects of probiotics were suggested, such as improved immune system, modification of gut microbiota, reduced inflammatory reactions, decreased ammonia and urea excretion, lower serum cholesterol and improved mineral adsorption; on the other hand probiotics may have an indirect positive impact on performance parameters and production profitability.

Conclusions

Probiotics have a number of beneficial effects in poultry production. Probiotics improves feed intake, feed conversion ratio, stimulates growth rate, increases egg production and have hypocholesteronemic effects on poultry products. It is also improve the gut health, immune system. The probiotics have a wide range of mechanism of action that eventually improve growth performance or eliminate the pathogens like *Salmonella* and *E. coli* in chicken. The growth performance due to probiotics feeding directly relates to the immune functions and healthy guts. Despite the wide use of probiotics in poultry production, an accurate dosage of administration has yet to be established. It can be mixed into water and feed with different dosages.

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