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Probiotic use of *Saccharomyces boulardii* in Poultry

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ABSTRACT

After the restriction on the use of antibiotics due to their resistance in the host results in the formation of many alternative products. One of the recent advances in finding alternatives to antibiotics is the probiotics which are potentially used as biotherapeutic agents to improve and enhance animal health. *Saccharomyces boulardii* is one of the most frequently used probiotics in poultry and which has many positive effects on the bird's health. It helps in improving the performance of the poultry birds and has potential effect on the growth of birds, increases productivity of birds, helps in the development of the immune system.

Introduction

The term probiotics is used for those living organisms which provide growth and health benefits when they are given to the host animal in a specific amount [1, 2]. *S. boulardii* which is now widely used as a probiotic in poultry is a tropical yeast which was first discovered by a French scientist Henri Boulrad in 1923 [3]. Many researches have shown that *S. boulardii* as a probiotic improves the intestinal environment of the host and shows greater resistance against *Escherichia coli, Shigella flexneri, Vibrio cholera, and Salmonella typhimurium* [4]. As a member of the yeast family S. boulardii cell wall consists of mannans, chitin, glucans, and yeast hydrolysis products for example vitamins, nucleotides. All these above-mentioned products are helpful for the performance of poultry gut, production, and immune system [5, 6]. The major effects of *S. boulardii* on different aspects of the bird's health and how it will help to manage them with different infections has been shown in this article. The reduction in the GIT disorders and also an alternative of the antibiotics the *S. boulardii* is widely in use as a probiotic.

Major functions performed by *S. boulardii:*

Some of the major functions performed by the *S. boulardii* includes the maintenance of the microbiota of the intestinal tract where it hinders the pathogenic microorganisms and also helps in the regulation of immune function of the body. Due to this the rate of infections decrease at a high level and the growth and production of the bird increases.

Maintenance of gut microflora:

Yeast consists of only < 0.1% of the total fungi of the gut microbiota of the poultry while others consist of the bacteria, protists, and archaea. The major portion of gastrointestinal microbiota is composed of bacteria which is appropriately 1× 10*4 [7]. The properties of *S. boulardii* which makes it potential to be used as probiotics include growth at 37°C (Table 1), hydrophobic characteristics, ability of auto-aggregation, and tolerance rate against bile salts and gut acids. Other than these characteristics, susceptibility against antifungals is also of great importance [8]. Studies have been shown that the supplementation of *S. boulardii modulates* the ultrastructure of the intestine through the modification of the tight junction protein expression in the broiler chicken [9].

Immunomodulation:

Study has been taken to check the effectiveness of *S. boulardii* against the *Clostridium perfringens* infections in the bird. The basic purpose was to observe the effect of *S. boulardii* on the macrophage cell line HD11. The outcomes of this research show that the phagocytosis ability and the bactericidal capacity of the HD11 cells increase against the *C. perfringens.* This is done by *S. boulardii* which enhances the mRNA expression of different cell-surface molecules like CD80, CD83, and CD197 in HD11 cells which are infected with *C. perfringens* [10]. And in another research study it was observed that after the oral supplementation of *S. boulardii* the level of TLR2, TLR4 and TLR15 enhanced in the small intestine especially in the jejunum and ileum of the broiler chickens. The level of TLR2 and TLR4 gene expression was up-regulated after the administration of *S. boulardii* in the colon of chicken [11-13]

Reduction in Infection Rate:

It has been studied and proved that the supplementation of *S. boulardii* has positive effects on the control and inhibition of many pathogens including *C. perfringens* [14], *Salmonella* [15], *Campylobacter* [16], and *Listeria* [17] (Figure 1). It has also been studied that an auxotrophic strain of *S. boulardii* helps in the inhibition of *Listeria monocytogenes* in the chicken breast strips. The function of the *S. boulardii* is to help in the expression of a gene named lecC which encodes for the bacteriocin leucocin C. bacteriocin leucocin C. Now the beer used to marinade chicken breast strips should have antilisterial activity if it contains strain of *S. boulardii* [17].

Table 1. The basic physiological and metabolic characteristics of *S. boulardii* [8,18, 19, 20]

No.	Characteristics	*S. boulardii*
1.	Optimal temperature for growth	37°C
2.	High temperature resistance	65% viability
3.	Basic pH resistance	pH=8
4.	Tolerance to bile acids	Only up to 0.10% (w/v)

Figure 1. Benefits of probiotic use of *S. boulardii*

Conclusion:

The use of *S. boulardii* as a probiotic yeast in poultry most likely occurs after the antibiotic resistance in the poultry. After the restriction of use of antibiotics due to their resistance and their metabolic residues in the food products the need of something else other than antibiotics was a major concern of the developers and the researchers. The use of living pathogens as probiotics is of great success. The *S. boulardii* as a probiotic helps to enhance the production of poultry birds. It helps through the maintenance of intestinal microbiota and also regulates the immune function of the host. Not only does productivity increase but also the growth rate of birds increases. The quality of meat and other products was also enhanced.

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