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# Probiotics Interaction with Foodborne Pathogen: A Potential Alternative to Antibiotics

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## Abstract

The antibiotics have been considered one of the key tools that are utilized in the present day in the healthcare industry for fighting against the bacterial infections; none-the-less, the misuses or the repeated utilization of the antibiotics, resulted in the bacterial resistance, which causes considerable threats for numerous people with the common bacteria infections. Using the probiotics for the enhancement of the gastrointestinal health was suggested for several years. Recently, there was a growing interest in using the probiotic bacteria as substitutes for the antibiotics to prevent or treat a variety of the intestinal infections. Numerous significant underlying mechanisms that are responsible for antagonistic impacts of the probiotics on a variety of the micro-organisms include: (a) competitive exclusions for the nutritional sources and the adhesion sites; (b) antimicrobial substance secretion; (c) immunomodulation (d) enhancements of the function of the intestinal barrier.

**Keywords:** Probiotic; Food Borne Pathogen and Antibiotics

## Introduction

Numerous yeasts and bacterial strains were so distant characterized as possibly probiotic [1]. Probiotic can defined "a live microbial food supplement which beneficially affects the host animal by improving its intestinal microbial balance" [1]. There are several criteria for selecting the probiotics as shown in (Figure 1) and probiotic enhance the immune system (Figure 2).

Food-based probiotic products are responsible for numerous probiotic formulations and may be divided into 2 distinct classes, which are: the dairy products like the yogurts, acidified milks and creams cheeses, milk, ice cream, and non-dairy products, such as

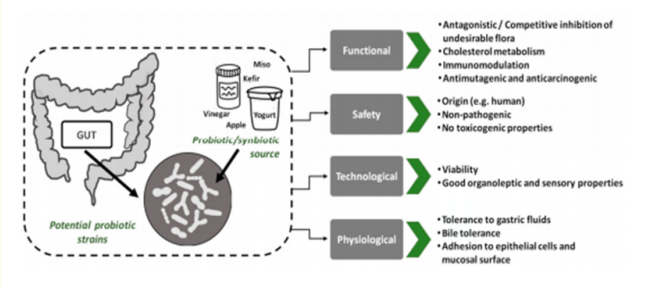


**Figure 1:** Criteria for the selection of probiotic strains.

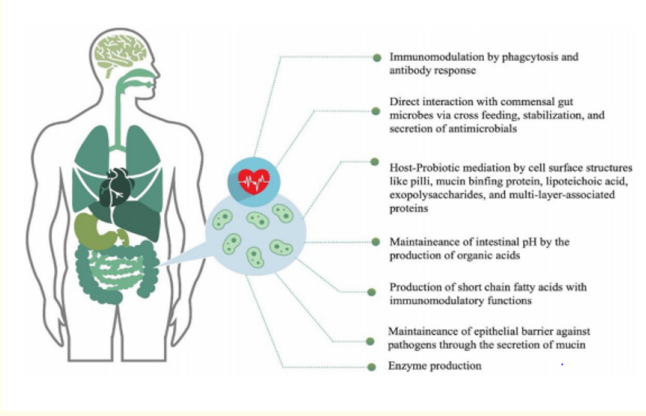


**Figure 2:** Probiotics action mechanism for host immune enhancement.

the, meats and meat products, bread or other fiber snacks, fruit juice, and chocolate [3,4].

## Probiotics in foodborne disease

Probiotic with great health benefits and protect host against foodborne illness. Foodborne diseases can be highlighted as one of the most severe public-health issue, considerably affecting the population health and results in serious socio-economic implications [5,6]. Probiotic food products can be consider as the promising approaches for modulating of gastrointestinal microbiota due to their interaction with the gastrointestinal [6]. Lactic acid bacteria (LAB) is the most used as probiotic and have a significant impact on the food, clinical and agricultural applications [7]. The main foodborne pathogens are *Clostridium perfringens, E. coli*, *Campylobacter jejuni*, *Listeria monocytogenes, S. aureus* and *Salmonella* species [8]. Those pathogens developed multi-drug resistance and resulted in massive economic losses in the developed and the developing countries [9].

LAB ferment the food carbohydrates and generate the lactic acid as main fermentation product. Moreover, degradations of the proteins and the lipids and production of different aldehydes, alcohols, esters, acids and Sulphur compounds play a role in developing specific flavors in a variety of the fermented food products [10]. Throughout the fermentation, the bacteria produce organic acids as well as other metabolites, enhancing the development of the flavor in food, preventing the spoilage, and therefore are highly beneficial in numerous applications, particularly in dairy and food industry [11]. Due to the fact that the LAB naturally produces bacteriocins, which are helpful in the bio-preservation of the food, they play the role of inhibitory, antagonistic, and antimicrobial defense system, acting against the spoilage microbes and pathogens [12]. Generally, the bacteriocins result in cell death through the inhibition of the bio-synthesis of the cell wall or through the disruption of membrane by pore formations. Which is why, the bacteriocins are of a high importance in the fermentations of the food where they may result in the prevention of the spoilage of the food or inhibiting food pathogens [13].

## Antibiotic associated diarrhea treatment by probiotic

Diarrhea is one of the common problems in the developing as well as the developed countries. There is a number of diarrhea causes, however, the most common one is the fecal contaminated foods and waters, used probiotics for preventing diarrheal complications. LAB have beneficial effects in the diarrheal diseases, particularly in the children, using LAB that contain foods like fermented milk and yogurt have to be promoted in the children [14]. The probiotics used recently were suggested as a possible alternative to prevent or treat AAD (i.e. antibiotic-associated diarrhea) that maybe one of the complications of the majority of the antibiotics and *Clostridium difficile* disease (CDD), provoked by the antibiotics and has been defined as one of the leading causes of the nosocomial outbreaks of colitis and diarrhea [15].

## Encapsulation probiotic

Up until now, numerous approaches have been available for encapsulating the probiotics, like the extrusion, spray drying, phase separation and emulsion, ionotropic gelation and freeze drying [16]. Information and guidelines from FAO and WHO have proven the importance for probiotic strains to stay intact via upper intestinal tract for the confirmation of the health enhancing impacts when entering their action site, irrespective of the applied mode of delivery. For instance, for the purpose of assuring the fact that it was stated that the so-called "minimal therapeutic" level of the viable probiotic bacteria have to be a minimum of $10^6$CFU/g of viable cells over the shelf life of the product [17]. The enormous food product availability makes them a sufficient and possibly effective carrier system for delivering probiotics. None-the-less, their capability for delivering the viable cells to human intestines could considerably vary, highly depending upon physic-chemical characteristics of every one of the composite food matrices.

Figure 3 factors that affect the probiotics' viability in the food products (throughout the storage and processing), in addition to gastrointestinal tract (GIT). Figure 4 show the general procedure for functional evaluation and safety of the probiotic for uses in the food applications.

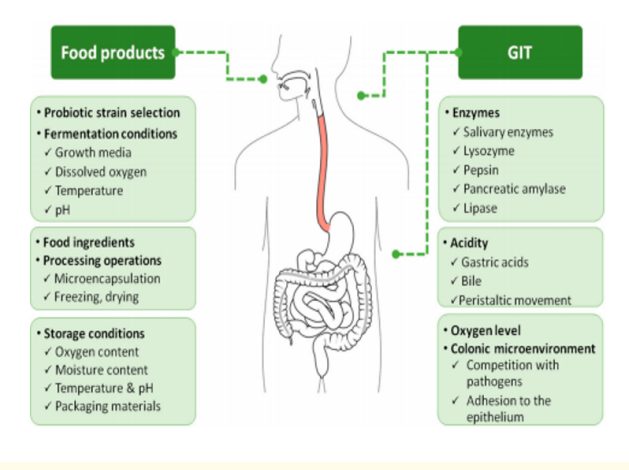


**Figure 3:** Factors affecting viability of probiotics in food products (during processing and storage), as well as in the gastrointestinal tract (GIT).

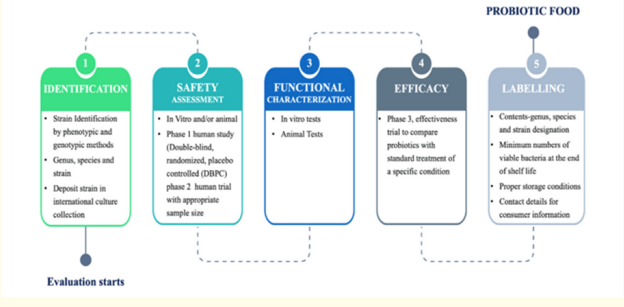


**Figure 4:** General procedure for the safety evaluation of probiotics for application in foods.

## Conclusion

Probiotic recently used in food to prevent foodborne pathogen through production several antimicrobial substance that inhibit or killed pathogen, also probiotic prevent diarrhea/and antibiotic associated diarrhea and support immune system.

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