

The Probiotics: A Mini Review of Their Benefits and Biological Effects

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ABSTRACT

The term ‘microbiota’ refers to the bacteria, archaea, micro eukaryotes and viruses that share the human body space and function in a commensal, symbiotic or pathogenic relationship. Exactly which microbiota develops is dependent on factors such as: The method of delivery and the environment in which birth takes place, the mother’s microbiota and the manner of feeding microbes are often called the “forgotten organ”, due to its crucial role in physiology in healthy humans.

Probiotics are live microorganisms that confer a health benefit when consumed in adequate amounts, suggested by the Food and Agriculture Organization (FAO)/World Health Organization (WHO) in 2002. The most commonly used probiotics are *Lactobacillus*, *Bifidobacterium* and *Saccharomyces boulardii*. Probiotic products have been developed for a wide variety of health claims. Benefits associated with them have been reported scientifically by many independent research groups in several academic journals. These benefits include lowering intestinal pH, reducing the colonization of pathogenic bacteria, improving the host immune system, treatment some diarrhea types, improve oral flora and positive effects in emotion, cognition and other psychological processes. More researches have suggested that the probiotic activities also positive influence the aiding the lactose intolerance systems, shortening of rotavirus diarrhea.

Key words: *Lactobacillus*; *Bifidobacterium*; *Saccharomyces boulardii*; Microbiota

INTRODUCTION

Definition of probiotics

‘Microbiota’ refers to the bacteria, archaea, micro eukaryotes and viruses that share the human body space and function in a commensal, symbiotic or pathogenic relationship [1]. The term probiotic is derived from the Latin, which means “for life”. ‘Probiotics’ first appeared in this context in 1974 and has conceptually evolved to its current common definition as live microorganisms that confer a health benefit when consumed in adequate amounts, suggested by the Food and Agriculture Organization/World Health Organization in 2002 [2]. Latest definition is more specific in terms of the host and types of microorganisms and not restricted to the intestinal microbial community [3].

Humans evolved as “super organisms”; this is because they have a symbiotic relationship with the microbial community that resides in the gastrointestinal tract and is essential for health. Each body habitat harbors a characteristic bacterial community, which is not constant throughout life, but rather changes with age. At birth, the Gastrointestinal Tract (GIT) of any animal is sterile and it is rapidly colonized by bacteria from the mother and the environment. This colonization by the gut microbiota plays an important role in intestinal tract maturation, digestive physiology and immunology of newborn. Prior to birth, microorganisms are absent from the GI tract, but quickly colonize it during and after birth. Exactly which microbiota develops is dependent on factors such as: The method of delivery and the environment in which birth takes place, the mother’s microbiota and the manner of feeding. In the meantime, probiotics are applied as feed supplements,

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pharmaceuticals, dairy products, fruit juices, chocolates and even meat products [4-6].

However, quantitative assessment of this microbial ecosystem has varied. As early as the 1970s, it was established that the number of microbial cells is far higher than human cells, with an estimated ratio of 10 microbial cells to each human cell [7-9].

The most commonly used probiotics are *Lactobacillus*, *Bifidobacterium*, and *Saccharomyces boulardii*. *Lactobacillus* and *Bifidobacterium* are gram-positive rods that are obligated facultative anaerobes and *S. boulardii* is a yeast. *Lactobacillus* includes several individual species, the most notable of which include *L. acidophilus*, *L. rhamnosus*, *L. bulgaricus*, *L. reuteri*, and *L. casei*. Similarly, the *Bifidobacterium* species that are most commonly used in probiotics include *B. animalis*, *B. infantis*, *B. lactis* and *B. longum*. New microbial groups (e.g., yeast and *Bacillus*) and more specific lactic acid bacteria strains are constantly being identified. These microbial groups possess the ability to withstand unfavorable conditions of the human body (e.g., salivary enzymes, low pH and pancreatic juice), colonize gut epithelial cells and contribute to the health of the host environment regulating microbes and exerting biological functions [10-13].

Probiotic can refer to the following products: Probiotic drugs (medicinal products-live bio therapeutics products for human use), medical devices, probiotic foods (e.g., foods, food ingredients, dietary supplement or food for special medical purposes) and directly fed microorganisms. Their products have been developed for a wide variety of health claims. It can target both healthy and ill individuals. The expected effects can be of a preventive or curative nature [14].

LITERATURE REVIEW

Dosage and selection of probiotic

Cochrane review found that a dosage of 5 billion colony-forming units or greater per day was significantly more effective than a lower dosage and the duration of probiotic use depends on the clinical indication [15].

Choosing an appropriate probiotic is challenging, as a variety of factors are involved: The strain-specific and disease-specific efficacy probiotic products, differences in the mechanisms of action for different probiotic strains, differences in manufacturing processes and quality control of the products and differences in international regulatory requirements. International guidelines from infectious disease or pediatric disease organizations do not always agree with which probiotics should be used for each type of disease condition [16-18].

The selection of probiotic microorganisms requires a systematic approach. In most cases, the large number of isolated strains leads to the need to use a "step by step approach", consisting of a sequence of tests to progressively reduce the number of probiotic candidates. An ideal probiotic should have several potential characteristics such as, non-pathogenic and non-toxic in nature, beneficial to the host animal, high viability and stable on storage and in the field, able to survive in or colonize the gut and amenable to cultivation on an industrial scale [19].

Mode of delivery and efficacy

Many systems have been developed for the delivery of probiotics to the gastrointestinal system which include both conventional pharmaceutical systems and non-conventional commercial products. As mentioned previously the efficacy and extent of health benefits related to probiotic products is determined by their abilities to deliver an efficient viable culture at their site of action. Viability will change during processing and storage.

Scope and application

The use of probiotics may target several body sites like mouth, GI tract, respiratory tract, urinary tract, skin, vagina, etc., and its application can also target specific human subpopulations: Healthy individuals, children, elderly, ill subjects and immune compromised and genetically predisposed individuals, among others. Indeed, alterations in the delicate host-microbe relationship is nowadays recognized as associated with a wide variety of diseases such as cancer, neurological, ophthalmological, premature newborn, extra-intestinal and intestinal diseases and metabolic disorders, such as non-alcoholic fatty liver disease and type 2 diabetes.

In the randomized, double-blind, placebo-controlled trial, they proved for the first time that supplementation with the multispecies probiotic supplement ecologic® barrier favorably modified glucose metabolism, lipid profile, waist circumference, visceral fat, serum uric acid level and Lipopolysaccharide concentration in obese postmenopausal women.

On survey from South Africa (SA), a total of 104 unique probiotic products were included. Of the 104 probiotics identified, more than half (51%) had GIT health claims for adults and 17% were indicated for GIT and skin conditions in infants. Less than 10% of the probiotic products had claims in multiple health categories such as GIT and immunological health. Medicinal claims of probiotics in both cities were similar. Less than 4% of probiotics in both cities in SA (4/104; including Provacare® Probiotic Vaginal care, Reuterina™ Femme, UltraFlora® Women's, Vagiforte® Plus) were explicitly for vaginal health.

However, innovations in the probiotic domain are critically hampered by market challenges, such as difficulties obtaining regularity approval and competition with marketed probiotics with no evidence base. So far, European Food and Safety Authority (EFSA) has rejected all submitted health claims for probiotics [20].

Probiotics and gut health

The Gut Microbiota (GM) has been estimated to have more than 1000 bacterial species and 100 trillion bacteria with 150-fold more genes than the human genome that colonizes in the human intestinal tract. Normally, anaerobes are more represented than aerobes and the majority of species belong to the genera *Bacteroidetes* and *Firmicutes*. From birth to old age, several factors could play roles in shaping human gut microbiome, such as diet, exercise, antibiotics, diseases and aging. Although environmental factors play dominant roles in

shaping microbiome composition, different genetic backgrounds may still contribute to diverse host responses for maintaining microbiome homeostasis.

Probiotics and cancer

Besides several health benefits, probiotic bacteria have also been reported to contribute a major role in immunomodulation and displaying antitumor properties. Probiotics act as a double-edged sword in this field. Accumulative investigations have revealed that microbiota can participate in the process of carcinogenesis of many types of cancers, including gynecological cancers. For instance in cervical cancer, dysbiosis is approved to have influences on both Human Papilloma Virus (HPV) infection by affecting HPV acquisition, clearance and persistence and host immune response by affecting the levels of immune system proteins such as Transforming Growth Factor β 1 (TGF- β).

Probiotics and mental health

Probiotics are also known as “psychobiotics” because of their positive effects in emotion, cognition, and other psychological processes. In recent years, many studies have been carried out around the world that use probiotics to regulate psychiatric disorders. Studies found that under stress conditions, probiotics can play a beneficial role by regulating the synthesis and release of a variety of neurotransmitters and bioactive factors including cortisol. Some studies investigated the relationship between the effect of probiotic microorganisms on controlling the symptoms and prevention of re-hospitalization in mental disorders, including bipolar disorders. Probiotic concentration of *Faecalibacterium* was significantly lower in bipolar patients than in the non-bipolar. Different studies have shown the aptitude of bacterial species to produce the neuromodulators and neurotransmitters including norepinephrine, Gamma-aminobutyric acid, dopamine, serotonin and acetylcholine. Probiotics can impact other brain-related complaints such as stress and multiple sclerosis.

Probiotics and oral health

In recent years, more and more studies have found that probiotics can not only regulate intestinal flora, but also improve oral flora. Especially probiotics have been confirmed through interaction with oral pathogen to inhibit the growth of pathogenic bacteria, thus playing an active role in the maintenance of oral health and the prevention of oral diseases, such as caries and chronic periodontitis, oral candidiasis and halitosis and the concentration of harmful bacteria. According to clinical studies, a series of commercial products containing probiotics to treat oral diseases are available on the market, for example: Probiora health™, Blis technologies, Oral complete, Oral health probiotics, Advanced oral probiotics, Hyperbiotics® and Probiotic oral refresh.

Immunity and probiotics

Probiotics have been shown not only to be effective in helping to prevent infections but also to play a potential role in disrupting the pathways that result in common inflammatory

autoimmune disorders. The intake of probiotics has been associated with beneficial effects on the immune system, such as improved disease resistance and reduced risk of allergies. In the organism of a healthy animal stimulate non-specific immune response and enhance the system of the immune protection. It has been discovered that conventional animals with a complete gut flora have increased phagocytic activity and immunoglobulin levels compared with germ-free animals. The improvement in the immune system may be by three different ways: Enhanced macrophage activity disturbance and enhanced ability to phagocytose microorganism; increased agent and increased local antibodies at mucosal surfaces such as the gut wall, usually Immunoglobulin A (IgA).

DISCUSSION

Probiotics have been shown to be effective at curing a number of viral diseases by modulating the immune system. It could contribute to the development of novel therapies that may reduce the pathogenicity of Zika Virus (ZIKV). Furthermore, Corona Virus Disease-19 (COVID-19) may be related to the gut microbiota, since some evidence highlighted a secondary gut infection or dysfunction in patient with Respiratory Tract infections, probably due also to antibiotics which are not selective towards harmful bacteria. This suggest also a gut-lung crosstalk and in some extent that the symptoms may be modulated by probiotics, altering in this way the gastrointestinal symptoms favorably and protecting also the respiratory system.

CONCLUSION

It has been known that microbiomes play a major role in proper maintenance of human health. But through time humans may exposed for condition called ‘dysbiosis’. In order to cross over this microbial disbalance and get back their beneficial effect, probiotics come in to the deal and defined as live microorganisms that confer a health benefit when consumed in adequate amounts, suggested by the Food and Agriculture Organization/World Health Organization in 2002. The most commonly used probiotics are *Lactobacillus*, *Bifidobacterium* and new microbial groups (e.g., yeast and *Bacillus*) and implicated in many aspects of human health and the animal productivity.

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