

An Overview on Probiotics

Mayur Porwal, Associate Professor,

Department of Pharmacy, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

Email Id- mayur.porwal1@gmail.com

ABSTRACT: *Probiotic bacteria have grown in popularity over the past two decades as a consequence of mounting scientific data demonstrating their positive benefits on human health. There is scientific data that suggests including probiotics into one's diet may provide health advantages. When it comes to the prevention and treatment of some diseases, this data seems sufficient, but when it comes to others, it appears promising or even contentious. As a consequence, they've been used in a variety of goods, with the food sector playing a key role in researching and marketing them. Probiotics have been used in a variety of goods, mostly fermented dairy foods, in this market. Given this tendency, and despite solid scientific evidence linking these microbes to a variety of health advantages, further study is required to establish them and assess their safety as well as nutritional elements. The aim of this article is to examine the existing research on the idea of probiotic bacteria and their potential beneficial qualities, with an emphasis on those found in food.*

KEYWORDS: *Allergy, Diarrhoea, Health, Lactose, Probiotics.*

1. INTRODUCTION

The link between probiotics and happiness has a long history. Tissier discovered that the gut microbiota of healthy breast-fed babies was dominated by rods with a bifid shape (bifidobacteria), which were missing in formula-fed infants suffering from diarrhoea, establishing the idea that they played a role in preserving health. Since then, a number of studies have backed up this claim, although they were initially poorly planned and controlled, and they encountered practical difficulties such as strain specificity of characteristics and probiotics' sluggish growth on substrates other than human milk. They've effectively developed through time, with the most recent ones amassing more significant proof that probiotic bacteria may benefit human health. These findings, along with rising consumer knowledge of the link between health and nutrition, have created an enabling climate for the creation of the functional food concept, which describes foods or food components that offer health benefits beyond their nutritional worth. The functional food industry is growing, particularly in Japan, its origin, with additional possibilities in Europe and the United States, and probiotics account for the majority of its goods in most nations[1]–[3].

Probiotics:

The word probiotic comes from the Greek language and means "for life." However, the definition of probiotics has changed through time in tandem with the growing interest in the use of live bacterial supplements and advances in understanding their mechanisms of action. The term was first used to describe substances produced by one microorganism that stimulated the growth of others, but it was later expanded to include tissue extracts that stimulated microbial growth and animal feed supplements that benefit animals by contributing to the balance of their intestinal flora. Until recently, Fuller's definition was the most commonly used, and it helped to shape the probiotic idea in many ways: "probiotics are live microbial feed additives that benefit the host animal by enhancing microbial balance." The current definition is provided by the Food and Agriculture Organization of the United Nations World Health Organization, which defines probiotics as "live bacteria that bestow a health benefit on the host when supplied in sufficient quantities." In the context of food, the

definition may be tweaked to emphasize that microorganisms have a positive impact "when eaten in sufficient quantities as part of food"[4]–[9].

Microbial Species with Applications as Probiotics:

Taking their definition into account, the number of microbial species that may have probiotic characteristics is staggering. Only strains categorized as lactic acid bacteria are relevant in terms of nutrition, and among these, those belonging to the genera *Lactococcus* and *Bifidobacterium* have the most significant characteristics in a practical setting. Lactic acid bacteria are Gram-positive, catalase-negative bacteria that ferment carbohydrates to generate lactic acid as the primary end-product. Because they utilize a different metabolic route, the species *Bifidobacterium* is usually not phylogenetically classified among them. *Streptococcus thermophilus* and *Lactococcus lactis*, two of the most economically significant lactic acid bacteria, also serve a major role in the food business, especially dairy products, though they are not technically called probiotics.

Mechanisms of Probiotic Activity:

Probiotics have a variety of modes of action, but the precise mechanism by which they exert their benefits is yet unknown. These include bacteriocin and short-chain fatty acid synthesis, gut pH reduction, nutritional competition, and mucosal barrier function stimulation and immunomodulation. Probiotics affect many elements of the acquired and innate immune responses by promoting phagocytosis and IgA production, changing T-cell responses, increasing Th1 responses, and attenuating Th2 responses, according to several studies.

Probiotics and Food Products:

Probiotic strains are found in a broad variety of food items, which is continuously expanding. The most popular dairy products on the market include fermented milks, cheese, ice cream, buttermilk, milk powder, and yogurts, with the latter accounting for the majority of sales.

Soy-based products, nutrition bars, cereals, and a variety of juices are examples of nondairy food uses for probiotic delivery to the customer. Aside from safety, the compatibility of the product with the microbe and the preservation of its viability during food processing, packaging, and storage conditions are also variables to consider when assessing the efficacy of including probiotic strains into such goods. The pH of a food, for example, influences the survival and development of the integrated probiotic, which is one of the reasons why soft cheeses seem to have a variety of benefits over yoghurt as delivery methods for viable probiotics to the gastrointestinal tract.

Health Benefits of Probiotics:

Probiotics' claims of positive benefits, such as improved gut health, improved immunological response, lower blood cholesterol, and cancer prevention, are being more supported by research. These health characteristics are strain-specific and are influenced by the aforementioned processes. While some of the health advantages have been well proven, others need further research to be confirmed. In reality, considerable evidence supports probiotic usage in the treatment of acute diarrhoeal illnesses, the avoidance of antibiotic-associated diarrhoea, and the enhancement of lactose metabolism, but inadequate evidence supports their use in other clinical situations[10].

Antibiotic-Associated Diarrhoea:

Diarrhoea, mild or severe, is a frequent side effect of antibiotic treatment because the natural microbiota is inhibited, allowing opportunistic or pathogenic strains to thrive. Diarrhoea without mucosal abnormalities to pseudomembranous colitis are all possible symptoms. Antibiotic-associated diarrhoea is a severe type of diarrhoea (caused by *Clostridium difficile*, cytotoxic strains of which may emerge after antibiotic use). The term comes from the plaque-like adherence of fibrinopurulent material to the injured mucosal layer, and it is characterized by diarrhoea, abdominal distention, vomiting, fever, and leukocytosis, as well as consequences including toxic megacolon and perforation if left untreated. The treatment comprises of discontinuing the causative antibiotic, correcting electrolyte imbalances, and, in extreme instances, metronidazole or vancomycin therapy. Treatment using probiotics, such as *L. rhamnosus* and *S. boulardii*, has been utilized in clinical practice. Probiotic usage has been linked to a lower incidence of antibiotic-associated diarrhoea in many trials.

Infectious Diarrhoea:

The most well recognized health advantages of probiotic bacteria are the treatment and prevention of infectious diarrhoea. Rotavirus is the world's most frequent cause of acute infantile diarrhoea and a leading cause of newborn death. The virus replicates in the small intestine epithelium's highly specialized absorptive columnar cells, and the normal microflora seems to play a key part in the host's response to the infection, since antigen absorption in germ-free animals is much higher than in normal mice. Probiotic addition of baby foods has been used to prevent rotavirus infections as well as to treat existing illness. Probiotics such as *L. rhamnosus* GG, *L. reuteri*, *L. casei* Shirota, and *B. animalis* Bb12 have been demonstrated in well-controlled clinical trials to reduce the duration of acute rotavirus diarrhoea, with the greatest evidence pointing to the efficacy of *L. rhamnosus* GG and *B. animalis* Bb12. Competitive blockade of receptor site signals controlling secretory and motility defenses, amplification of the immune response, and creation of chemicals that directly inactivate virus particles are among the suggested methods.

Lactose Intolerance:

Lactose intolerance is caused by a genetically programmed lack of beta-galactosidase, which prevents lactose from being hydrolyzed into the monosaccharides glucose and galactose. When undigested lactose reaches the big intestine, bacterial enzymes breakdown it, causing osmotic diarrhoea. Beta-galactosidase deficiency may be acquired and is generally reversible. Other reasons include pelvic radiation, which destroys the mucosa, rotavirus infection, which infects lactase-producing cells, and short bowel syndrome. After consuming milk or milk products, lactose intolerant people experience diarrhoea, stomach pain, and flatulence. Although conventional yoghurt preparations containing *S. thermophilus* and *L. delbrueckii* ssp. *Bulgaricus* are more effective in this regard, partly due to higher beta-galactosidase activity, lactose metabolism improvement is a claimed health benefit attributed to probiotics, and it appears to involve specific strains more than others and in specific concentrations. As a result, and since some people have reacted well to probiotic supplementation, doctors should explore it as a treatment option.

Probiotics and Allergy:

Recent research indicates that early life exposure to bacteria may protect against allergies, and in this case, probiotics may offer a safe alternative to microbial stimulation for babies' growing immune systems. At the same time, they enhance mucosal barrier function, which is thought to aid in the modulation of allergic responses. The involvement of intestinal microbiota in allergy is supported by quantitative and qualitative differences between children and babies with allergies and healthy children and infants, with the former showing colonization by a more adult-like type of microflora. Food allergies and atopic dermatitis seem to be especially affected by probiotic actions. The latter is a common chronic relapsing skin disease of children, with genetic predisposition as well as the individual's exposure to environmental allergens playing a role in its etiology. Only a few strains have been evaluated for their effectiveness in the treatment and prevention of newborn allergy.

Other Health Benefits:

The list of health advantages mediated by probiotics is not limited to the ones described so far, but also contains a number of potential effects that need to be confirmed in human research. Probiotic bacteria are dietary components that may have a role in cancer prevention, according to research. The exact mechanisms are unknown, but studies have shown that certain *Lactobacillus* and *Bifidobacterium* spp. reduce the levels of carcinogenic enzymes produced by colonic flora by normalizing intestinal permeability and microflora balance, as well as producing antimutagenic organic acids and boosting the immune system of the host.

Furthermore, research indicates that probiotic bacteria-containing foods may help prevent coronary heart disease by lowering serum cholesterol levels and improving blood pressure management. Interference with cholesterol absorption from the gut, direct cholesterol assimilation, and the production of end fermentation products that affect systemic blood lipid levels and mediate an antihypertensive effect are all proposed mechanisms. Nonetheless, these probiotic effects are still up for debate, as more research in long-term human studies is required. Finally, probiotic strains found in dairy products have been demonstrated to enhance the treatment result in women with bacterial vaginosis, most likely by assisting the normal vaginal lactobacilli microbiota.

2. DISCUSSION

Probiotic is a contemporary term that means "for life" and is used to describe bacterial associations that have positive impacts on human and animal health. Probiotics have important functional properties that could meet the majority of our nutritional and clinical supplement needs. These microorganisms have demonstrated favorable reactions to clinical therapy for a variety of illnesses and disorders, including rotavirus diarrhea, IBS, and food allergies. Furthermore, the role of probiotics in the prevention and treatment of diabetes, obesity, cancer, and diseases caused by pathogenic microbes is a fascinating and rapidly developing research area. Dietary probiotic supplementation is most often associated with dairy products, however probiotics may also be found in fermented non-dairy foods, providing an alternate and more beneficial source for testing novel probiotic strains. Furthermore, current clinical and nutritional assessments have shown some surprising activities of certain probiotic strains.

3. CONCLUSION

Bowel problems such as lactose intolerance, antibiotic-associated diarrhoea and infectious diarrhea, and allergies are among the well-documented impacts, and new data is

accumulating on their possible involvement in a variety of other illnesses. Such products are becoming more popular at the same time as relevant consumer knowledge is growing, and they tend to constitute one of the biggest functional food markets. Dairy products, especially yoghurt, remain the most significant vehicles for delivering probiotic bacteria to consumers, with the nondairy industry developing as well as a consequence of advancements in food technology and rising demand. As the variety of new goods with enhanced sensory appeal expands, customer acceptability grows, and the food sector spends more in this expanding market by developing new methods and products, creating a virtuous cycle.

Nonetheless, probiotics for human use are still in their early stages of research. More study, in the form of controlled human trials, is required to identify which probiotics and doses are most effective for particular patients, as well as to show their safety and limits. Furthermore, the regulatory position of probiotics as food ingredients must be defined on an international scale, with a focus on effectiveness, safety, and the validation of medical claims on food labels. There is no doubt that the role of probiotics in nutrition and medicine will grow significantly over the next decade, and while their use in the prevention and cure disorders must be considered by medical practitioners and encouraged by the food industry, it should be done with caution and respect for the consumer.

REFERENCES:

- [1] M. E. Sanders, D. Merenstein, C. A. Merrifield, and R. Hutkins, "Probiotics for human use," *Nutrition Bulletin*. 2018, doi: 10.1111/nbu.12334.
- [2] C. Castañeda Guillot, "Probiotics: An update," *Revista Cubana de Pediatría*. 2018, doi: 10.1016/j.jpdp.2014.08.006.
- [3] Y. Vandenplas, G. Huys, and G. Daube, "Probiotics: An update," *Jornal de Pediatría*. 2015, doi: 10.1016/j.jpdp.2014.08.005.
- [4] A. Zawistowska-Rojek and S. Tyski, "Are probiotic really safe for humans?," *Polish Journal of Microbiology*. 2018, doi: 10.21307/pjm-2018-044.
- [5] S. Doron and D. R. Snyderman, "Risk and safety of probiotics," *Clin. Infect. Dis.*, 2015, doi: 10.1093/cid/civ085.
- [6] R. George Kerry, J. K. Patra, S. Gouda, Y. Park, H. S. Shin, and G. Das, "Benefaction of probiotics for human health: A review," *Journal of Food and Drug Analysis*. 2018, doi: 10.1016/j.jfda.2018.01.002.
- [7] Y. Wang *et al.*, "Antioxidant properties of probiotic bacteria," *Nutrients*. 2017, doi: 10.3390/nu9050521.
- [8] K. R. Pandey, S. R. Naik, and B. V. Vakil, "Probiotics, prebiotics and synbiotics- a review," *Journal of Food Science and Technology*. 2015, doi: 10.1007/s13197-015-1921-1.
- [9] M. Bermudez-Brito, J. Plaza-Díaz, S. Muñoz-Quezada, C. Gómez-Llorente, and A. Gil, "Probiotic mechanisms of action," *Annals of Nutrition and Metabolism*. 2012, doi: 10.1159/000342079.
- [10] N. van Hai and R. Fotedar, "A review of probiotics in shrimp aquaculture," *Journal of Applied Aquaculture*. 2010, doi: 10.1080/10454438.2010.500597.