

Probiotics for Total Health: Better Today and Tomorrow

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Introduction

Mechanistic and stressful lifestyle of modern man has made him susceptible for one or the other disease and disorder in recent times. The growing consciousness towards health has brought significance for natural health care products. In this context, understanding the role of food in maintaining health has moved from its fundamental role as a source of energy to biological function of active food components on human health. Therefore, probiotics as functional foods or nutraceuticals are of great demand in now days and has drawn much attention for improving human health in natural way. WHO/FAO defined probiotics as 'live microorganisms which when administered in adequate amounts confer a health benefit on the host'. Ingestion of probiotic foods increase the number of friendly bacteria in the gut and play an important role in nutrition, digestion and immunity. The mechanism of probiotic action mainly includes competition with harmful bacteria in the gastrointestinal tract for adhesion and nutrients, enhancing host immunity to pathogens, by producing antimicrobial metabolites. Probiotics are also known for the restoration of increased intestinal tight junction permeability and unbalanced gut microbiota. The use of probiotics to treat colon cancer has gained much attention due to the positive results from *in vivo* studies. In our laboratory we evaluated the role of probiotic lactobacilli along with vincristine in controlling colorectal cancer [1,2].

Probiotic bacteria are equipped with enzymes that ameliorate not only gut but overall health status of an individual. Several studies have proven their ability to produce hydrolytic enzymes such as amylase, lipase, array of proteases capable of cleaving peptides resistant to gastric enzymes, cellulases, phytase, lactase and many more that aids digestion and nutrient absorption. These enzymes enable the probiotics to break down diverse food constituents that are difficult to undergo metabolism by vertebrate hosts such as inulin, galacto-oligosaccharides, resistant starches, and anti-nutritional food components such as tannins, phytates responsible for the chelation of minerals like iron, zinc, magnesium and calcium [3]. Pretreatment of such foods with probiotics with specific enzyme action enhance the nutritive quality of food and also helps to overcome metabolism related deficiencies. In addition, they are good source of vitamins and other micro nutrients. Therefore, probiotics treated foods with specific biological function are suggestive towards the improvement of defined physiological functions, and also to reduce the risk of disease incidence in the host. Our research team is working on the probiotic enzymes and their role in clinical nutrition with special emphasis on the development of gluten reduced wheat foods with improved nutritive value for celiac patients [4].

Probiotic treated foods such as yoghurt, acidophilus milk, soy milk, kimchi, kefir, fermented milk beverages, olives, fermented vegetables, fermented foods such as idly, dosa (Indian foods), ogi, kunnu, ugba (Nigerian foods) along with improved nutritive quality and bioavailability of the micro nutrients, possess anti oxidative property also. Anti-oxidative property helps to fight oxidative stress, strengthens host anti oxidative defense mechanism and delays aging. Therefore, such probiotic foods would be useful in conferring health benefits to people of all age. Furthermore, research in the field of enteric neuroscience revealed that the probiotics as beneficial gut microorganisms have

the ability to influence brain biochemistry, neural development and a wide range of behavioural phenomenon. Probiotics along with other gut commensal bacteria have been proven to alter gut-microbiome-brain axis communication, thus influencing the behavior of host. Pathogen exclusion and anti-inflammatory properties of probiotics helps in reducing stress and pathogen induced inflammation mediated depression. Hydrolysis of sugars, proteins and lipids in ingested foods by probiotics in the gut enhance the bioavailability of amino acids, fatty acids, vitamins and other essential micro nutrients, improving their absorption, fueling them to neurochemical synthesizing pathways. Probiotics also produce several gut peptides, neurochemicals and their precursors such as acetylcholine, GABA (gamma amino benzoic acid), catecholamines, serotonin, poly unsaturated fatty acids, tyrosin, tryptophan, vitamin K, ascorbic acid, biotin, short chain fatty acids and so on. These metabolites help to overcome the burden of anxiety and other depression symptoms and also influence endocrine function of host. Therefore, use of probiotics as a strategy for the prevention, management and treatment of depression and other mood disorders is in debate and thus, probiotics are also in spotlight of enteric neuroscience research.

In addition, probiotics have found an immense significance and application in infant formulas. Though mother's milk is considered as an ultimate food for new born babies, alternative nutrition may some time required when breast feeding is not possible due to insufficient milk, lactose intolerance, allergy to milk protein and others. In such conditions, infant formulas enriched with prebiotics and probiotics with blended essential nutrients are of great role in growth and development of such infants. Probiotics health drinks, beverages, yoghurt and other probiotic treated infant formulas are commercially available in the market for children of different age groups. In our laboratory, we are screening and characterizing probiotics with ability to hydrolyze milk protein for children with milk protein allergy (MPA). In addition, early microbial colonization of infants helps in the development of good immune system and confer resistance to several diseases, disorders and allergies at adult age. As probiotics as beneficial gut bacteria known to regulate gut brain communication, they also take part in the development of nervous system and plays an important role in the behavioural aspects, decision making and cognitive functions. As they are known to produce beneficial neurochemicals, they would certainly confer resistance for the development of depression in adult age.

Probiotics are also useful in controlling various types of microbial infections. Infectious bacterial, viral, parasitic diarrhea and antibiotic

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associated diarrhea (AAD) can be treated using probiotics. Probiotics helps host to fight diarrhea, competing with the pathogens for nutrition, host cell receptors for binding, producing bacteriocin like antimicrobial compounds, restoring increased intestinal tight junction permeability, out numbering the pathogenic bacteria particularly in case of AAD probiotics reduce the number of *Clostridium difficile* [5]. In addition, there is some preliminary evidence that probiotic bacteria may inhibit the gastric colonization and activity of *Helicobacter pylori* infection which is associated with gastritis, peptic ulcers and gastric cancer [6]. Therefore, probiotics have been proposed for improving the eradication rate of above mentioned infectious disease causing agents and for the compliance of multiple antibiotic regimen used for the infection.

Probiotics would be suggestive for pathogenic infections to metabolic disorders. They can be administered orally in the form of capsules or in the form of probiotic foods for people of all age. Probiotics not only confers physical health, but also mental health. They play an important role in behaviour of host. Though probiotics are small creatures, they are doing wonders. Therefore, probiotics are for total

health care, conferring wealth to their hosts in the form of good health and a healthy society.

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