

The Growing Significance of Probiotics on Health

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The confluence of all food-dependent life sustaining processes is in the gastrointestinal tract where the gut resident and food introduced microbes mix. Healthy living is conditioned on the proper functioning of the digestive ecosystem which is biologically affected by the state of the microbial load of the input, “food”, the interaction of food and the gut microbiota, producing the output—healthy living. Worldwide, overconsumption of high calorie nutrient deficient foods produces obesity, poor weight management, and health problems which changes the human gut ecosystem. These problems can be mitigated by introducing probiotics into the diet [1].

Probiotics, live bacteria and yeast commonly consumed as part of fermented foods such as yogurt or introduced as dietary supplements with specially added active live cultures, can help improve health. Gut microbes have been shown to impact host metabolism and restore the balance of gastrointestinal microbiota, ameliorate obesity conditions and help to maintain wellbeing. Some of the probiotics advocated for a range of illness, from constipation to cancer treatment include *Lactobacillus rhamnosus* strain GG and *Sacharomyces boulardii* [2,3].

Recent studies have attempted to identify specific positive health effects of probiotics for particular health conditions with mixed results [4]. The persistent challenges include difficulty generalizing health effects of particular probiotics, and the different effects of varying strains of probiotics on human health. As a result, the efficacy of one strain or species cannot necessarily be inferred from another [4]. But greater understanding of interactions of gut microbiota and the use of probiotics to help mitigate metabolic syndrome diseases and enhance overall health is increasing [5].

In general, the understanding of the influence of the human intestinal microbiota on the gut ecosystem and the link to improved health in humans has shown promise [6]. The presence of probiotics in the diet provides opportunity to continuously manipulate an individual’s gut microbiome, the mutually interacting system of host cells and resident microbial community [7].

Probiotic modulated microbiome may provide benefits from mixed gene effects of reducing inflammation and insulin resistance, and improving energy balance. An example is the finding that gut microbiota influences the capacity to harvest energy resulting to increased total fat accumulation [8]. DNA analysis of the gut microbiota suggests evidence of probiotic influence in nutrient acquisition, energy harvest, and impact on several metabolic pathways [9].

Significant effort is being expended in understanding the specific influence of microbiota composition, probiotic bacteria cohort consumption, and the possible benefits in healthy subjects—non obese healthy consumers [10]. Obese and non-obese populations have different bacterial populations and gut microbiota composition, impacting individual weight loss; the composition drives the rate of weight loss interventions by affecting digestion of nutrients [11].

Research studies are indicating that probiotics may be useful for prevention of respiratory infections in children, dental caries, irritable

bowel syndrome, and inflammatory bowel disease [10]. There is strong evidence of the use of different probiotic strains to prevent and treat diarrhea, treat irritable bowel syndrome, treat inflammatory bowel disease, colon cancer, acute diarrheal disease, antibiotic-associated diarrhea and *Clostridium difficile* [12]. Areas of future interest for the application of probiotics include colon and bladder cancers, diabetes, rheumatoid arthritis, and dental caries [11]. The side effects of probiotics are generally mild, but drug interaction and complications may occur with the immune compromised [12].

Oral administration of most bacteria results in large loss of viability due to passage through the stomach which lowers the effectiveness and efficacy of the ingested probiotics. Delivery of the probiotics to the gut in a form that preserves the viability is essential in maintain the growth of probiotics. Microencapsulation, the process of covering the probiotics with materials such as alginates, reduces cell death in the stomach, and increases the number of viable cells delivered to the intestinal tract [13]. The growing use of probiotics will continue the long quest for the prolongation of life started long ago by Dr. Elie Metchnikoff [2].

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