Editorial

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Advancements in Prebiotics

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Prebiotics, including probiotics, are being studied extensively for their potential applications in various fields of applied science, especially as nutrients and supplements. However, there is a scarcity of new studies on the usability of prebiotics. The following are few examples of cutting-edge science that has advanced our knowledge of prebiotics. “Prebiotics are a set of nutritionally enriched compounds clustered together with the efficiency to stimulate and promote the development and sustenance of specific beneficial gut microflora,” according to the National Institutes of Health. Prebiotics are non-digestible molecules that can directly modulate the sustenance of health-promoting gut bacteria.

Because of the advancement of numerous ‘omic' methods such as proteomics, genomics, metabolomics, transcriptomics, and so on, we now have a better understanding of the dynamics and usability of these non-digestible substances. As a result, research focused on different modes of synthesis has become the current era's priority. For large-scale production and application, the food industries of the present decade need easy, sustainable, cost-effective, and high-efficiency methods. Prebiotic oligosaccharides can be derived naturally from fruit, but they can also be made chemically or enzymatically from disaccharides or other substrates, or by hydrolysis of polysaccharides. Since most natural prebiotics have already been tested for their beneficial effects, researchers are now looking for new prebiotic oligosaccharides using enzyme-based technologies. For their synthesis, enzymes (β-galactosidase, fructosyltransferase, etc.) from diverse sources such as microbes and plants are used. Furthermore, enzymes are designed to help control regioselectivity and increase reaction yield, which improves glycodiversification and the consistency of the products produced. Again, the advent of genetically modified microorganisms resulted in a rise in the development of oligosaccharides (2’fucosyllactose) for large-scale industrial production through the fermentation method.

Because of the clear connection between prebiotic oligosaccharides and the gut microbiota, as well as the preservation and restoration of microbial homeostasis, which is linked to the host's overall health, prebiotic research is receiving a lot of attention these days. Prebiotic compounds are food-grade substances from which beneficial short-chain fatty acids can be formed as a result of oxidation by microbes including *Bifidobacteria* and *Lactobacilli* within the host, which makes them appealing as nutrient supplements. Their biological benefit extends beyond the gastrointestinal system to other processes as well. In recent studies; researchers found that consuming Galacto-Oligosaccharides (GOS) directly improves calcium absorption, bone density, and strength in rats. Prebiotics like Fructo-Oligosaccharides (FOS) and Galacto-Oligosaccharides (GOS) are likely to use this association to tune brain-derived neurotrophic factors, d-serine, and other synaptic proteins like synaptophysin and N-methyl-d-aspartate receptor subunit. Prebiotics such as oligofructose, β-fructan, and oligofructose/inulin mix have also been shown to have immunomodulatory effects in the cases of pathogenic invasion, atopic dermatitis, allergic prevention, chronic inflammation, and up-regulated vaccine responses. Benefits of this non-digestible substance have also been discovered for a number of skin-related ailments. GOS supplementation improved water preservation and prevented erythema in the skin of hairless mice. On GOS therapy, studies show that increased dermal expression of cell adhesion and matrix structure markers CD44 and type 1 collagen improves skin barrier properties. GOS, alone or in combination with *B.breve*, is found to prevent phenolic compound-induced water and keratin depletion. Similarly, prebiotics are currently being researched for their potential application in the treatment of a variety of disorders and diseases.s.