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EDITORIAL

Journey from Probiotic to Synbiotic - Way Forward

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The term probiotic originates from merging of two Greek words: "pro" means "for" and "biotic" means life and was first used by Lilley and Stillwell in 1965 to define the substances secreted by one microorganism which stimulates the growth of another. Initially, it was perceived as opposite to the action of antibiotic. In the year 1971, Sperti defines "probiotic" as a "tissue extract which stimulates microbial growth". In due course of time, the concept of probiotic was relooked by Parker and in 1974; he defined probiotics as "organisms and substances which contribute to intestinal microbial balance". In view of the growing knowledge and understanding on the subject, Fuller proposed a new definition of probiotic in the year 1989. Accordingly, it is "a live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance". In the light of growing popularity of probiotic and lack of international consensus on the methodology to assess the efficacy and safety, a joint Food and Agricultural Organization of the United Nations and World Health Organization (FAO/WHO) expert consultation was held in Argentina during October 1 to 4, 2001. The consultative meeting redefined the probiotic as "live microorganism which when administered in adequate amounts confers a health benefit on the host".

In view of intense research and global development, the International Scientific Association of Probiotics and Prebiotics (ISAPP) convened a meeting to re-examine the concept of probiotic on 23rd October 2013 by involving clinical and scientific experts from gastroenterology, paediatrics, family medicine, gut microbiology, microbiology of probiotic bacteria, microbial genetics, immunology, food science in addition to original expert panel members of FAO/WHO working group of probiotic. During the meeting, endeavour was made to have consensus statement to satisfy all probiotic stakeholders including consumers, researchers, healthcare professionals, industries, legislators in order to frame clear guidelines for defining and using probiotics for health and wellbeing. The panel members retain the FAO/WHO definition of probiotic with minor grammatical corrections: "live microorganism that, when administered in adequate amounts, confer a health benefit on the host". Evidently, it holds on to the essence of probiotic i.e. microbe, viability and benefits to health.

Even though, the word "probiotic" emerges in the field of modern biological science in 1965, nevertheless, historical evidences suggest its application since the beginning of human evolution; nearly 10,000 years ago. During the early days of civilization, fermented milk was thought to be one of the important drinks amongst people and today's functional food perception; it is the oldest functional food. Similarly, Persian version of Old Testament (Genesis 8:18) states: "Abraham owed his longevity to the consumption of sour milk". The Sumerian wall paintings also depict evidences of fermented milk consumption dating back to 2500 BC. In 76 B.C., Roman historian Plinius suggested use of fermented milk for the treatment of gastroenteritis. The hypothesis of improving gastrointestinal microbial balance, health and longevity through consumption of beneficial bacteria emerges at the beginning of twentieth century through genius works of Tessier H. Paris and Elie Metchnikoff. Tessier recommended consumption of Bifidobacteria for children suffering from diarrhoea to supersede the growth and multiplication of putrefactive bacteria.

Similarly, Elie Metchnikoff hypothesized that consumption of yoghurt containing lactobacilli lead to reduction of toxin producing bacteria in the gastrointestinal tract, followed by increased longevity of the host. Presently, probiotic finds its application in numerous sectors including food, feed, dairy, drinks, pharmaceuticals, confectionary, and value-added products etc. and expected to occupy significant niche in the regular diet of next generation population.

A new era in the medical science has emerged out after understanding the critical roles of the "forgotten organ" i.e. "gut microorganism" in health and disease of human and animals. Albeit, the gastrointestinal tract is sterile at the time of birth, nevertheless, it is colonized by numerous microorganisms belonging to all forms of life including bacteria, archaea, virus, fungi, protozoa etc. Indeed, the number of microbes is approximately ten times more than the number of human body cells and the collective microbial genome (popularly termed as gut microbiome) is vastly greater than human genome. Upon introspection on the function of gut microorganism, it is ample clear that some of these teensy creatures have the ability to make human pow-

erfully sick; while other members are responsible for health and wellbeing. The latter one offers the opportunity to the functional food researchers for application of probiotic/prebiotic/symbiotic towards restoration of normal microflora or dominance of beneficial organism in the gastrointestinal tract

In this perspective, the concept of prebiotic was introduced by G.R. Gibson and M.B. Roberfroid in the field of functional food science during mid-nineties of previous century. The prebiotics are conceptualized as "non-digestible food ingredients that beneficially affect the host by selectively stimulating the growth and or activity of one or a limited number of bacteria in the colon". Since then, several prebiotics are discovered and their functionality has been established. A few of them are inulin, fructooligosaccharides, xylooligosaccharides, galacto-oligosaccharides, pectin oligosaccharides, soya oligosaccharides, chitin oligosaccharides etc. Because of their potentiality to exhibit multiple beneficial effects on human health and animal production, prebiotic receives greater attention among the global researchers for large scale production as well as evaluation involving *in vitro* studies, animal models, clinical trials for curing of gastrointestinal disorders. Looking into the growing research trends and development, the Food Quality and Standards Service (AGNS), Food and Agriculture Organization of the United Nations constituted a technical committee on prebiotics. According to FAO, the prebiotic is "a non-viable food component that confers a health benefit to the host associated with modulation of the microbes". The technical committee on prebiotic of FAO suggested three criteria to qualify a molecule as prebiotic: (i) Component-not an organism or drug; a food grade substance that can be characterized chemically, (ii) Health benefit-measurable effects and (iii) Modulation-brings out changes in the composition or activities of microbiota.

Nevertheless, the prebiotics are characterized by their non-digestibility in the stomach, selective stimulation of the beneficial gut microflora, biological origin and does not leave harmful residue in the body. In case, the present trend continues, the global prebiotic market size expected to exceed USD 7.5 billion by 2023.

In view of increasing healthcare expenditure coupled with phobia against modern therapeutics, a new concept in the name of "synbiotic" was forwarded during fag end of previous century to address the health challenges of 21st century population. Evidently, synbiotic is a product comprising of both prebiotic and probiotic. It is postulated that prebiotic improves the survivability of the probiotic organism in the upper gastrointestinal tract and thereby potentiates their effect in the large intestine of the host. The probiotic has been in use since early date of human civilization in one or other forms to enhance the number of beneficial gut bacteria. Nevertheless, the prebiotic is a recent concept and is an indigestible carbohydrate that travels to the large intestine for selective growth stimulation of beneficial gut microorganisms.

Additionally, fermentation of the prebiotics by the probiotics results in the production of beneficial by-products such as short chain fatty acids, vitamins, etc. Assuming the synbiotic relationship between prebiotic and probiotic, formulation of synbiotic is logical. However, development of successful symbiotic is challenging because it needs compatible combination for ensuring health benefits those are at par with combined benefits of prebiotic and probiotic. Recent investigation demonstrates efficacy of synbiotic against inflammatory bowel disease, liver related brain dysfunction, colorectal cancer, allergies etc.

The current global research and development on probiotic, prebiotic, synbiotic revolutionizes the functional food science. The market is growing rapidly to fulfil the growing needs of health-conscious population. Therefore, expectation in coming days will be more challenging because of growing consumer awareness, safety, and quality. It needs more scientific deliberations involving high quality trials on probiotic, prebiotic and synbiotic in addition to unravelling the mechanism of action through application of precise and advanced research tools. This might also open the gate for development of newer therapeutic strategies against disease. It is expected that probiotic, prebiotic and synbiotic will be able to cope up the emerging challenges in order to ensure human health and well-being in future.

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