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Editorial

Probiotics, Prebiotics, and Their Application in the Production of Functional Foods

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Food biotechnology innovation and development reached an estimated growth tendency rate of 28% per year. Consumers and industries have become more interested in novel foods with possible health-related functions. In addition, probiotics and prebiotics have gained attention due to the continuously increasing scientific evidence of their beneficial effects on human health, and are considered the most critical categories of functional foods that are studied and available worldwide [1,2]. Functional foods can benefit human health in different ways, such as affecting the gut microbial composition, modulating the immune response, reducing pathogenic bacteria due to antimicrobial substances production, etc. *Bifidobacterium*, *Lactobacillus*, *Pediococcus*, *Enterococcus*, *Streptococcus*, *Bacillus*, and *Escherichia* are the most frequently used bacterial genera in many available functional products. To assess a novel probiotic potential strain, experts from FAO, WHO, and European Food Safety Authority (EFSA) have established specific guidelines. All new proposed potential microbial strains must be evaluated regarding their safety and functionality according to the international guidelines before their use in different industries [3].

Given the importance of the matter, the Special Issue "Probiotics, Prebiotics, and Their Application in the Production of Functional Foods" has collected nine scientific contributions: seven original research articles and two review articles. An overview of these scientific contributions, which look at the diverse aspects of functional foods, is briefly reported in this editorial letter.

One of the original research studies focused on the collagen-peptide microencapsulation of five probiotic strains (*Lactiplantibacillus plantarum* MG989, *Lactococcus lactis* MG5125, *Enterococcus faecium* MG5232, *Bifidobacterium animalis* ssp. *lactis* MG741, and *Streptococcus thermophilus* MG5140) to investigate the efficacy of a novel additive in bacterial protection nunder different conditions. Kim et al. [4] determined that low-molecular-weight collagen-peptide is a stability enhancer for various probiotics and can improve viability after freeze-drying, simulated gastrointestinal conditions, and heat treatment.

Four original research studies focused on probiotic and postbiotic-related functional foods. Khoja et al. [5] investigated the effect of postbiotics manufactured by *E. coli* Nissle 1917 in functional labneh enriched with galactooligosaccharides on the adhesion abilities of probiotics. They found a positive impact of postbiotics on the cell surface and adhesive properties of selected probiotic strains, which could inhibit foodborne pathogen adhesion to Caco-2 cells. Another study by Darvish et al. reported that the functional postbiotics produced from yogurt cape gooseberry could significantly increase antimicrobial, antitumor, antioxidant activities, related to an improvement in total phenolic content [6]. In addition, Mo et al. [7] also recorded different, immune-enhancing effects of red ginseng extract-supplemented medium fermented by *Lacticaseibacillus paracasei* HY7017. The product enhanced TNF-α and IL-6 production from macrophages, IL-12, IFN-γ, and NK cell activity in splenocytes, the recovery of WBC levels, IL-2 and IFN-γ upregulation, and increased NK-cell activity from immunosuppressed mice. Finally, in a study by de Lima et al. [8], a potentially postbiotic-containing preservative (PPCP) was found to be efficient

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as a commercial preservative FCC85, which indicated that PPCP could be a promising alternative to preserve and develop functional cooked sausages.

The other original research study published in this Special Issue deals with fermented feed for hens using the fungus *Mortierella alpina* and its possible impact on the composition of the intestinal microbiota of hens, and egg fatty acids' profile. At the end of the study, the authors detected that the addition of omega-3 acids enriched fermented feed, positively affected the immune response of laying hens and improved the fatty acid composition of eggs [9].

Lastly, the study by Bósquez et al. [10] showed the possibility of near-infrared spectroscopy (NIRS) as a reliable, fast, and promising alternative to the conventional classical microbiology technique to determine probiotic viability.

Regarding the review articles, one of the contributions focused on recent technological advancements in probiotic encapsulation and the possibilities of delivering these functional cells at a specific site within the human gastrointestinal tract with high viability and stability [11]. In contrast, the other review article focused on traditional Mexican foods made of maize, agave varieties, nopal, and beans as a source of synbiotics to develop novel functional foods. They discussed the possible properties of these fermented foods, such as the presence of beneficial microorganisms and antioxidants, as well as the short-chain fatty acids (SFCAs) [12].

The current Special Issue contributes to improving our knowledge on diverse topics, such as the encapsulation and protection of functional cells in harsh conditions, prediction of cell viability in commercial probiotic products using novel approaches, and how to apply these beneficial microorganisms in the preparation of novel functional foods.

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