Postbiotics and its application in Food industry

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ABSTRACT

Postbiotics, or non-viable microbial cells, metabolic metabolites, and their microbial components released after lysis, are all considered to be postbiotics. Postbiotics help limit carcinogenesis and pathogen infections by regulating the immune system, gene expression, preventing pathogen binding, and maintaining intestinal barriers. Postbiotics have positive physiological, immunological, neuro-hormonal, regulatory, and metabolic effects and possess antibacterial, antioxidant, and immunomodulatory activities. Postbiotics are used to maintain and improve the nutritional value of food, get rid of biofilms, and condition the skin in cosmetics. With no possibility of bacterial transfer from the gut to blood or the acquisition of antibiotic resistance genes, postbiotics have many advantages over live bacteria.

Key words: postbiotics, inanimate, mechanism of action, application

Introduction

As consumers have recently become considerably more aware of the importance of nutrition and health, they have showed increased interest in considering and purchasing healthier meals. As a result, there is an increase in food products making functional claims. It is interesting to note, however, that these functional foods lack a recognised definition on a global scale. Nutraceuticals, probiotics, prebiotics, and synbiotics are some of the main types of functional foods in addition to fermented traditional foods.

Live microorganisms known as probiotics have been shown to have positive effects on health when consumed, usually by enhancing or re-establishing the gut flora. The gut flora digests a group of nutrients known as prebiotics. In fact, given their health benefits and advantages in manufacture and storage over probiotics, prebiotics seem to be promising candidates for improving human health as a replacement for or in addition to probiotics. Synbiotics are probiotic and prebiotic supplements that either work alone to provide one or more health benefits or combine to provide a health benefit that might not be seen if taken separately (Aggarwal et al., 2022).

Recent research has shown that dead cells, whether intact or ruptured, may also have important effects on human health, leading to the addition of additional words such paraprobiotics (inactive cells of probiotics) and postbiotics (metabolites of probiotics). While postbiotics, which are derived from the probiotic cells, have health benefits for the host when given in sufficient amounts, the effects of intestinal microbiomes on health depend on the viability of the microbiome and are also dependent on inanimate microbiome products Postbiotics are therefore defined as microbiota-produced metabolites or components that have an effect on human health.

Postbiotics

Preparation of inanimate microorganisms and/or their components that confers a health benefit on the host" is the definition of postbiotics. In comparison to probiotics, postbiotics have special advantages like stability, safety, and widespread use. Although postbiotics are a growing area of research, there is still very little done in this area.

According to this definition, postbiotic is the presence of inactive bacteria in whole or in part, with or without metabolic by-products. The definition put forth by International Scientific Association for Probiotics and Prebiotics (ISAPP) is thorough enough to permit the creation of postbiotics from various microorganisms, to be used in various body sites, and to promote innovation in a promising field for any regulatory category, for companion or production animals, for plants or human health. Probiotic goods may contain inert microorganisms that have the potential to be beneficial to health from a technology standpoint. Even though at least one probiotic has been demonstrated to provide the same health benefit by live or inanimate cells, their contribution to health in the majority of cases has not been established (Vinderola et al., 2022).

Advantages over probiotics

1. Available in their pure form
2. Ease in production and storage
3. Availability of production process for industrial-scale-up
4. Specific mechanism of action
5. Better accessibility of Microbes Associated Molecular Pattern during recognition and interaction with Receptors

Postbiotics form

The various postbiotic molecules consist of metabolic by-products of live probiotic bacteria, such as cell-free supernatant, vitamins, organic acids, short-chain fatty acids, secreted proteins/peptides, bacteriocins, neurotransmitters, secreted biosurfactants, amino acids, flavonoids derived postbiotics (desaminotyrosine, equol daidzein, daidzein, norathyriol), terpen

Due to their well-known chemical structure, long storage stability, and capacity to activate various mechanisms in controlling inflammation, pathogen adhesion to the GIT, obesity, hypertension, coronary artery diseases (CVD), cancer, and oxidative stress, various postbiotic molecules have attracted attention. It's intriguing that postbiotic formulations have received patent approval as bio-therapeutics for the specific medical condition known as "immune-modulation. Similar patents have been issued for postbiotics, which are metabolites of lactic acid bacteria that are used as feed additives and anti-tumor drugs for monogastric animals (Zhong et al., 2022).

Health benefits

Postbiotics have positive benefits, including immunomodulatory, antibacterial, and anti-cancer action. It lowers blood pressure, cholesterol levels, proliferative qualities, inflammation, oxidative stress, and body weight.

Healthy people tolerate postbiotics well. However, some individuals should refrain from consuming probiotic-rich meals to raise their postbiotic levels, such as those who have just undergone surgery, those who have structural heart abnormalities, those who have digestive tract illnesses, pregnant women, and young children. Due to their weakened immune systems, these groups may be more susceptible to undesirable reactions.

Some foods, such as buttermilk, cottage cheese, fermented pickles, yoghurt, and high-fiber meals like oats, flaxseed, and

garlic, may enhance the postbiotics in the stomach. Several researchers claimed that both internal and environmental factors might have an impact on how well postbiotics function. Active postbiotic metabolites can have their actions inhibited by internal factors such the resident microbiota, enzymes, and different dietary constituents (Rad, et al., 2020).

Due to their non-hydrolytic stable chemical structure, prolonged shelf life, and non-toxicity, postbiotics are a developing class of anticancer medicines (Nataraj et al., 2020). By preventing mutagenesis and bacterial translocation and inducing pro-apoptotic pathways, apoptosis, and autophagy, postbiotics can modify immunological response.

Additionally, postbiotics have antiatheroschlerotic properties that aid in lipid metabolism and reduce the chance of developing a number of cardiovascular disorders. Examples include Lactobacillus bacteria, which increases HDL cholesterol production while decreasing LDL cholesterol and triglyceride levels. Additionally, SCFA causes statin-like actions by preventing the condensation of the precursors to cholesterol.

Food application

In recent years, probiotic, prebiotic, and postbiotic functional foods have attracted a lot of attention from academics, producers, and consumers. A large portion of postbiotic research is currently devoted to developing novel functional foods and preventative drug formulations for enhancing host health, in addition to precisely identifying their mechanisms of action. To meet the nutritional needs of consumers with various dietary preferences, such as those who are allergic to milk proteins, lactose intolerant, and vegetarians a wide range of food products with bioactive ingredients, such as probiotics, dairy, and non-dairy products, are already available on the market. Because their proper dosage can be controlled during production and storage settings, where survival is not the primary determining factor, postbiotics can be used in delivery systems such functional foods and/or pharmaceutical goods (Thorakkattu et al., 2022).

References

Aggarwal, S., Sabharwal, V., Kaushik, P., Joshi, A., Aayushi, A. and Suri, M .2022. Postbiotics: From emerging concept to application. Frontiers in sustainable food systems. 6:887642.

Vinderola, G., Sanders, M.E., Salminen, S. 2022.The Concept of Postbiotics. Foods. 8(11) :1077.

Rad, A. H., Abbasi, A., Kafil, H. S., and Ganbarov, K. 2020. Potential pharmaceutical and food applications of postbiotics: a review. Current Pharmaceutical Biotechnology,. 21, 1576–1587

Nataraj, B.H., Ali, S.A., Behare, P.V. *et al.* 2020. Postbiotics-parabiotics: the new horizons in microbial biotherapy and functional foods. Microbial Cell Factories,**19**, 168

Zhong, Y., Wang,T., Luo, R., Liu, J., Jin, R and Peng, X. 2022. Recent advances and potentiality of postbiotics in the food industry: Composition, inactivation methods, current applications in metabolic syndrome, and future trends, Critical Reviews in Food Science and Nutrition, DOI: 10.1080/10408398.2022.2158174

Thorakkattu, P.,Khanashyam, A.C., Shah, K., Babu,K.S., Mundanat, A.S., Deliephan, A.,Deokar, G.S., Santivarangkna, C.,Nirmal, N.P.2022. Postbiotics: Current

Trends in Food and Pharmaceutical Industry. Foods,(11), 3094.

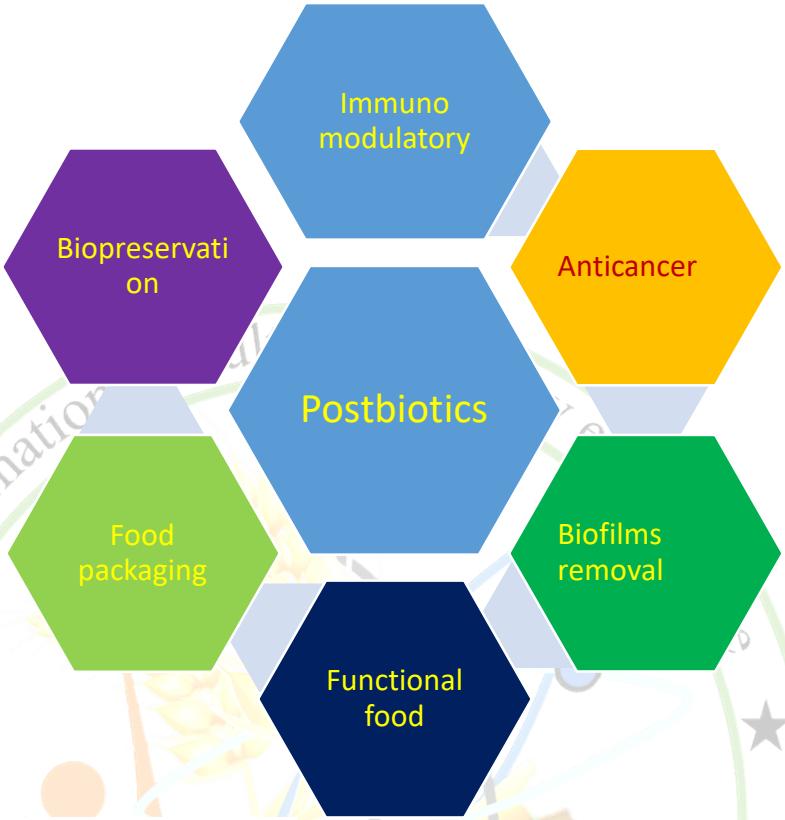

Fig 1. Application of postbiotics in food industry