

Role of Prebiotics and Probiotics in Meat Processing

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ABSTRACT

Functional foods can be any meal or drink that is fortified with nutrients or contains a specific functional component. Probiotics and prebiotics are two of the most well-known types of functional foods. Because of their numerous health-beneficial qualities, the pre and probiotics are being studied all over the world. Apart from the health benefits, they are widely used in meat and milk products.

INTRODUCTION

With the change in lifestyle and eating habits over time, there has been an increasing incidence of non-communicable diseases such as hypertension, obesity, cancer, etc. The growing awareness of the relationship between diet and health has led consumers to look for foods that are wholesome, safe and minimally processed that support health above and beyond the basic nutrition. The concept of food being a medicine stated by Hippocrates "Let food be thy medicine and medicine be thy food," is receiving renewed interest. Functional foods are being studied

worldwide because of their several health-beneficial properties. The British Nutrition Foundation defines functional food as 'foods that deliver additional or enhanced benefits over and above their basic nutrition'.

The term functional foods include a broad range of products; it can be any food or drink that may be fortified with nutrients or contain a particular functional ingredient. There has been an increased global interest in the recognition of nutraceuticals and their role in the enhancement of health (Faujdar et al., 2016). Food as medicine

first gained ground in Japan in the mid-1980s with the introduction of Food for Specified Health Use (FOSHU). Among the most well-known functional foods are the group or class of probiotics and prebiotics.

Probiotics

The word "probiotics" was coined by Lilly and Stillwell in 1965. Probiotics are live microorganisms (bacteria and yeast) that, when ingested in adequate quantity, impart beneficial effects on the equilibrium and physiological functions of human intestinal flora. These probiotic cultures may also be available as a supplement or as components of foods and beverages. The role of probiotics in food and meat processing has been recognised since long ago; for instance, the lactic acid bacteria (LABs) can be referred to as 'the heart' of fermented meat and milk products. In our country, LABS are widely used in several of the traditional fermented milk products, such as yoghurt and sour milk, whereas their application in meat processing is not so common except in a few states of North Eastern India. The most widely studied probiotic cultures belong to the genera *Lactobacillus*, *Bifidobacterium*, and *Enterococcus*. However, the effects imparted by probiotics are strain-specific and not attributed to the whole species or group. The genus, species, and an alphanumeric identification are used to identify a probiotic strain (eg: *Lactobacillus casei* DN-114 001).

The International Association for Probiotics and Prebiotics (ISAPP) stated key aspects of probiotic use in food as follows:

- A probiotic must be alive when administered.

- A probiotic must have undergone controlled evaluation to document health benefits in the target host.
- A probiotic must be a taxonomically defined microbe or combination of microbes (genus, species, and strain level).
- A probiotic must be safe for its intended use.

Prebiotics

The realisation of the functional health benefits of prebiotics is quite new compared to that of probiotics. Prebiotics are basically food ingredients that are not broken down in the stomach or absorbed in the GI tract but fermented by the GI microflora and selectively stimulate the growth or the activity of intestinal bacteria which is associated with health and wellbeing. Prebiotics reach the intestine in an intact form and act as fertilisers for the probiotics. According to ISAPP, an ingredient must possess the following three criteria to have a prebiotic effect: resistance to degradation by stomach acid, enzymes, or hydrolysis; capability of undergoing fermentation by intestinal microbes; and finally, stimulation of the growth and activity of beneficial microbes in the gut. More specifically, they are short-length carbohydrates that resist digestion in the upper GIT and ferment in the colon to produce short-chain fatty acids that impart positive effects on colonic cell growth and stability. The three most widely accepted prebiotics are fructo-oligosaccharides (FOS), inulin, and galacto-oligosaccharides.

The prebiotics support the growth of probiotics and are together called synbiotics', as the terms 'pro' and 'pre' also mean 'before' and 'for' indicating that prebiotics function as fertilisers for the probiotic culture. Both probiotics and prebiotics are reported to work in synergistic

manners. The term synbiotic is generally used when a product contains both probiotics and prebiotics and exerts the effects of both probiotics and prebiotics.

The estimates of the global retail market for probiotic and prebiotic foods and beverages by packaged facts in 2008 were approximately \$15.4 billion.

Health benefits of probiotics and prebiotics:In general, probiotics and prebiotics help in the prevention of cardiovascular diseases, colon cancer, allergies, the treatment and prevention of hepatic encephalopathy, diarrhoea of different origins, the eradication of *Helicobacter pylori*, and boosting the immune response.

Probiotics: They stimulate the host's mucosal immune mechanism by creating antagonism and competition with potential pathogens. The live culture in probiotics can help establish the gut microbial population in conditions like antibiotic-related dysbiosis and help prevent diarrhoea caused by antibiotics. The nutritional benefits of probiotics are attributed to some of their properties, including alleviation of lactose intolerance, protection against gastrointestinal infections, an anti-carcinogenic effect, stimulation of the immune system, lowering of serum cholesterol, and antihypertensive activity. In general, probiotics are helpful in improving gut health and stimulating immune function. They increase the production of IgA and B lymphocytes by activating local macrophages. They are known to produce bacteriocins that inhibit microorganisms, modify the pathogen's toxins, and are also capable of scavenging free radicals.

Prebiotics:As mentioned earlier, they support the growth of beneficial bacteria such as *Lactobacillus* and *Bifidobacteria* and suppress

pathogenic organisms. Fermentation produces short-chain fatty acids. They also enhance the calcium absorption from the gut and increase the faecal bulk, thereby shortening intestinal transit time. Prebiotics have also been reported to have a lowering effect on the blood lipid level.

Probiotics and prebiotics in meat and milk products

Probiotics like lactic acid bacteria have been widely used in fermented foods and serve the dual purpose of promoting fermentation while imparting beneficial health effects. Fermentation results in a lowering of pH that prevents microbial growth and also imparts characteristics to the taste profile of several products, including meat and milk. Shelf life extension is one of the major objectives of the fermentation of food.

Meat fermentation is a preservation method that requires low energy, and produces biological acidification or reduction of pH that results in the development of unique and distinctive properties such as flavour, texture, colour, palatability, tenderness, and an improved shelf life. The natives of the vast continents of Asia, Africa, and Latin America relish these attributes of fermented meat. Meat fermentation may be carried out either by natural or controlled fermentation, i.e., by allowing the propagation of the lactic acid bacteria that may be present as a natural contaminant in meat or by the addition of 'starter culture, respectively. However, the main concern is the conversion of the glycogen reserve in meat or added sugar to lactic acid by the lactic acid bacteria (LABs). The fermentation of meat generally yields meat that has a low pH and reduced water activity, which are hurdles for the control of microbial growth in meat products. Famous fermented meat products around the world include pepperoni, salami, bologna, cervelat, mettwurst, and so on.

Traditionally, milk was also fermented as a result of natural flora that may be present in milk or

present as a contaminant. Milk has been an important vehicle for the probiotic culture, which may be added to milk products or used in the fermentation of the same. Over the years, fermentation methods have developed to the point that the desired microbes are selected and fermentation is carried out under controlled conditions, resulting in the production of different products with higher nutritional values. The most dominant group being lactic acid bacteria (LABs), which are generally regarded as safe. Fermented milk in different countries may be categorised into three types: moderately sour with a pleasant aroma, e.g., cultured milk; sour and very sour types, e.g., curd, yoghurt; and acid cum alcohol milk, e.g. (Panesar, 2011). The probiotic bacteria of the genera *Lactobacillus* and *Bifidobacterium* are widely used in commercial dairy products today.

CONCLUSION

The traditional lactic acid bacteria that have been associated with food fermentation are generally considered safe for oral consumption or as a part of a food supplement or ingredient. However, there is little knowledge about the long-term effects of most dietary supplements except vitamins and minerals. As per the FAO/WHO (2002) organisation report, more research input is required with respect to the pathological, genetic, toxicological, immunological, gastroenterological, and microbial safety aspects of the new probiotic strains. A suitable

description of probiotic products is also much needed from a scientific perspective.

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