Chapter 6
The Effects of Probiotic Cultures in Functional Foods: Technological Aspects of Probiotics

Gulden Basyigit Kilic
Mehmet Akif Ersoy University, Turkey

ABSTRACT

Functional foods are an important part of an overall healthy lifestyle that includes a balanced diet and physical activity. The consumption of probiotic foods has many benefits. Dairy products that contain probiotic bacteria are those that are produced with various fermentation methods, especially lactic acid fermentation, by using starter cultures and those that have various textures and aromas. Fermented dairy probiotic products are popular due to their differences in taste and their favourable physiological effects. However, recent upsurge in interest of consumers towards dairy alternatives has opened up new research areas for developing non-dairy probiotic products. Different substrates such as cereals, fruit juices, vegetables can be used utilized for delivering these beneficial microorganisms. This chapter provides an insight on the recent research/developments about selection criteria of bacteria as probiotics and in the field of technological properties of probiotics.

INTRODUCTION

For centuries, lactic acid bacteria (LAB) have been used for the preservation of food for the human consumption. LAB are a large group of fermentative, anaerobe facultative, aerotolerant microorganisms which are usually present in the gut of humans and other animals, raw vegetables, meat and meat products, and cereals. During the fermentation process, LAB also influences the sensory properties of a product, including the flavor development. Flavor compounds are formed by various processes, e.g. the conversions of lactose and citrate (glycolysis and pyruvate metabolism), fat (lipolysis), and proteins (proteolysis, peptidolysis, and amino acids catabolism) (Yoon et al., 2006). LAB quickly acidifies the raw material through the production of organic acids, mainly lactic acid. They also produce acetic acid, ethanol, aroma compounds, bacteriocins, exopolysaccharide (EPS)s, and several important enzymes

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and they enhance shelf life and microbial safety, improve texture, and contribute to the pleasant sensory profile of the end product (Hati et al., 2013). Their numbers may vary with the animal species, the age of the host, or the location within the gut. In the food industry, lactic acid bacterial strains are widely employed either as starter cultures or as non-starter lactic acid bacteria (NSLAB). Furthermore, owing to their probiotic properties, several LAB strains are used as adjunctive cultures in foods and feed.

Probiotic which originated from a Greek term "probios" meaning "for life" as against "antibiotics" which means "against life" has become a significant concept in biomedical research. It refers live microbial food supplement which when administered in adequate amounts confer health benefit of consumers by maintaining or improving their intestinal microbial flora. The US Food and Drug Administration (FDA) uses other terms for live microbes for regulatory purposes; live microbes used in animal feeds are called "direct-fed microbials" (USDA, 2010), and when intended for use as human drugs, they are classified as "live biotherapeutics" (Vaillancourt, 2006). Probiotics are mainly members of genera *Lactobacillus* and *Bifidobacterium*, are normal residents of the complex ecosystem of the gastrointestinal (GI) tract of humans. Foods are carriers for the delivery of probiotic microorganisms to the human body. The growth and survival of probiotics during gastric transit is affected by the characteristics of the food carriers, like chemical composition and redox potential. Same probiotic strains could vary in functional and technological properties in the presence of different food ingredients or in different food environments (Ranadheera et al., 2010). In this chapter; selection of probiotic cultures, functionality of probiotics and culture production, effects of probiotics on quality parameters of fermented food products will be presented.

BACKGROUND

Probiotic bacteria, according to the definition adopted by the World Health Organization (WHO) in 2002, are live microorganisms, which when administered in adequate amounts confer a health benefit to the host (WHO/FAO, 2002a). The normal human digestive tract contains about 400 types of probiotic bacteria that reduce the growth of harmful bacteria and promote a healthy digestive system. The probiotic strain must be a normal inhabitant of the human intestinal tract and be able to survive acid in the stomach and bile in the small intestine. Probiotic strains should also persist in the GI tract to prevent their rapid removal by intestinal peristalsis. Colonization or at least temporary colonization is necessary for most probiotic organisms to exert their probiotic effects (Kailasapathy, 2013). The beneficial effects of food with added live microbes (probiotics) on human health, and in particular of milk products on children and other high-risk populations, are being increasingly promoted by health professionals. It has been reported that these probiotics can play an important role in immunological, digestive and respiratory functions and could have a significant effect in alleviating infectious disease in children (FAO/WHO, 2002b). Probiotic microorganisms, mainly those derived from the genera *Lactobacillus* and *Bifidobacterium* are closely related in terms of metabolism to lactic acid starter bacteria (Vinderola et al., 2011). *Lactobacillus* species from which probiotic strains have been isolated include *Lactobacilllus acidophilus, Lactobacilllus johnsonii, Lactobacilllus casei, Lactobacilllus rhamnosus, Lactobacilllus gasseri,* and *Lactobacilllus reuteri*. *Bifidobacterium* strains include *Bifidobacterium bifidum, Bifidobacterium longum,* and *Bifidobacterium infantis* (Heller, 2001). Other than these, some species of *Lactococcus*, *Enterococcus*, *Saccharomyces* and *Propionibacterium* are considered as probiotics due to their ability to promote health in the host (Zhang et al., 2010). These bacteria show symbiotic relationship with human.