The role of probiotics as functional food components

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ABSTRACT

Functional food components also known as nutraceuticals are those ingredients that provide a health benefit or desirable physiological effect beyond basic nutrition. These functional components include dietary fiber such as beta glucan, fatty acids such as omega-3 fatty acids, flavonoids, plant sterols, phytoestrogens, probiotics and prebiotics. According to recent marketing analyses, the functional food industry in the United States could double with estimate sales over $37.7 billion by 2007. This trend can be attributed to the growing consumer’s interest in maintaining their health, their aim for the improvement of their children nutrition, and their increased awareness regarding the connection between health and diet. An impressive list of functional foods has been recently launched into the market. In 2005 alone, sixty-nine value-added new products, targeted specifically to the children’s market, containing healthy omega-3 fatty acids, were introduced. We recognize the need to conduct research in the important area of functional foods. Therefore, our research group is focused on developing functional foods specifically containing probiotics. Probiotics, including bacteria from the genus *Bifidobacterium*, are lactic acid viable and metabolically active microorganisms which when administered in adequate amounts confer a health benefit on the host including improvement of gastrointestinal health and the immune system. In particular, we are interested in developing an acid whey beverage fermented with lactic acid bacteria and yeast cultures containing probiotics as adjunct cultures added post-fermentation. Current research includes the isolation of lactic acid bacteria from commercial sources such as yogurt and probiotic capsules and the characterization of the isolates as *Bifidobacterium* for the incorporation into the acid whey fermented beverage as an adjunct culture.

Key words: Probiotics, Functional foods, Nutraceuticals, *Bifidobacterium*

RESUMEN

Los alimentos funcionales también conocidos como nutracéuticos, contienen ingredientes bio-activos que proveen un beneficio nutricional o ejercen un efecto fisiológico adicional a su valor nutricional básico. Ejemplos de dichos ingredientes bio-activos incluyen fibra, ácidos grasos como los omega-3, flavonoides, esteroles, fito-estrógenos, prebióticos y probióticos. Recientes análisis de mercadeo reflejan una marcada tendencia de la industria de alimentos funcionales en los Estados Unidos en donde se predice que el mismo se duplicará, con estimados de ventas de sobre $37.7 billones en el 2007. Esta marcada nueva tendencia se puede atribuir al creciente interés del consumidor actual en mantener su salud, su interés en mejorar la nutrición

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de sus hijos y su entendimiento de la interacción entre buenos hábitos alimenticios y la salud. Una impresionante variedad de nuevos alimentos funcionales ha sido recientemente introducida en el mercado. En el 2005, por ejemplo, se lanzaron al mercado sesenta y nueve productos con valor añadido conteniendo ácidos grasos omega-3 y específicamente mercadeados para niños. Nuestro grupo de investigadores reconoce la necesidad de desarrollar alimentos funcionales, es por esto que actualmente estamos enfocados en el desarrollo de una bebida fermentada a base de suero ácido conteniendo probióticos. Los probióticos, como las bacterias del género Bifidobacterium, son cultivos viables de bacterias fermentadoras que cuando son consumidos en una dosis adecuada, promueven beneficios al individuo los cuales incluyen el mejoramiento del funcionamiento gastrointestinal e inmunológico. En particular, estamos desarrollando una bebida a base de suero ácido fermentada con bacterias y levaduras fermentadoras y con la adición de probióticos del género Bifidobacterium incorporadas luego de la fermentación. Dichos cultivos probióticos se están aislando de fuentes comerciales como lo son yogurt y cápsulas de probióticos. Dichas muestras luego de aisladas son caracterizadas y clasificadas a base de ensayos enzimáticos.

**Palabras clave:** Probióticos, alimentos funcionales, nutraceuticos, Bifidobacterium

**INTRODUCTION**

Growing consumer’s interest in maintaining their health, their goal for the improvement of their children nutrition, and their increased awareness regarding the connection between health and diet have increased their interest in foods that might promote health. Consequently, there is an increased demand for functional foods also known as nutraceuticals. The term functional food is arbitrary as most foods can be considered functional; however, the term has been mostly used for foods containing bio-active ingredients with unique characteristics and with an association with a health benefit. According to recent marketing analyses by the Business Communications Co. and their report on “Functional, nutraceutical, wellness foods and beverages” the functional food industry in the United States could double with estimate sales over $37.7 billion by 2007 (BCC, 2006).

This report also indicates that the categories within functional foods predicted to show the most impressive growth are that of soy foods and functional snacks growing to over $7.3 billion and $11.5 billion by 2007, respectively (BCC, 2006). These foods include in their respective lists, functional products containing probiotics. Probiotics are beneficial bacteria including the genus Bifidobacterium, that live naturally in our intestines and are essential to good health having a number of positive effects, primarily helping our digestive systems work efficiently. Probiotics as functional foods therefore are defined as a preparation or product containing viable, defined micro-organisms in sufficient numbers, which alter the microflora of the host intestine exerting beneficial health effects on the host (Schrezenmeier and De Vrese, 2001).
The term nutraceutical was first proposed in 1989 by the Foundation for Innovation in Medicine as a “food, dietary supplement or medical food that has a medical or health benefit including the prevention and treatment of disease”. Today this term is synonymous to functional foods and according to the International Food Information Foundation (IFIC, 2004) these are “foods or dietary components that may provide a health benefit beyond basic nutrition”; the Institute of Food Technologists Expert Panel expands this definition to include “...beyond basic nutrition for the intended population.” (IFT, 2005). These functional foods include conventional foods, fortified, enriched or dietary supplements. Some conventional foods such as fruits and vegetables contain bio-active components such as carotenoids including beta-carotene, lutein and lycopene that contribute to antioxidant defense and maintenance of healthy vision and prostate health. Other foods can be enriched to increased levels of their naturally occurring bio-active components and other foods can be fortified to provide the consumer with bio-active components that they do not contain naturally.

Besides carotenoids, some of these bio-active components also include dietary fiber such as beta glucan, whole grain and insoluble and soluble fiber found in oat bran, wheat bran and cereal grains that may reduce the risk of coronary heart diseases (CHD) and contribute to the maintenance of a healthy digestive system as they are fermented by colonic microflora, therefore, promote the production of beneficial short-chain fatty acids (SCFA) such as acetate, propionate and butyrate (Velázquez et al., 2000). Fatty acids including monounsaturated and polyunsaturated fatty acids, among the latter omega-3 fatty acids naturally found in salmon, walnuts and flax are considered bio-active components as scientific reports indicate that may also contribute to reduce the risk of CHD. Flavonoids including flavanols are other bio-active components within the group of functional foods. These are found in tea, cocoa, apples and grapes as well as flavonols found in onions and they may contribute in the maintenance of heart health and antioxidant protection, respectively. Furthermore, another category includes phytoestrogens such as the isoflavones daidzein and genistein found in soy and soy-based foods that have been indicated to contribute in the maintenance of bone health and immune function. Finally, probiotics including the genera Bifidobacterium and Lactobacillus found in yogurt and other dairy and non-dairy fermented products have been indicated to improve gastrointestinal health and the immune system and therefore are considered bio-active functional components.

**PROBIOTICS**

Probiotic bacteria are defined as microbial supplements which beneficially affect the host animal by improving its gastrointestinal microbial balance (Fuller, 1989; Gibson and Roberfroid, 1995; Hoover, 1993). Some of the microbial strains included in this definition are members of the genera Bifidobacterium and Lactobacillus. They are found in yogurts or specially formulated powders, supplement pills, fermented dairy or non-dairy based products and on probiotic drinks which contain one or more of the strains of...
these bacteria. Extensive research has been conducted on the role of probiotics, especially strains from the genus *Bifidobacterium*.

Some of the beneficial roles for human health attributed to the genus *Bifidobacterium* include treatment of gastrointestinal diseases (Bergonzelli et al., 2005), nutritional value (Mitsuoka, 1990), immunogenic effect via enhancement of cytokine production (Marin et al., 1997; Solis-Pereyra and Lemonnier, 1993), and immunoglobulin A (IgA) response (Tejada-Simon et al., 1999); anticarcinogenic and hypocholesterolemic effects (Modler et al., 1990) and pathogen inhibition (Gibson and Wang, 1994).

**PROBIOTICS AS FUNCTIONAL FOOD COMPONENT**

The dairy industry has a significant interest in introducing bifidobacteria as a probiotic to products such as yogurt, dairy beverages, flavored milk, cottage cheese and kefir as functional food components. Among these foods, kefir is a fermented milk drink native to Europe, which from a microbiological point of view is developed from the combined fermentation of yeast species such as *Candida kefyr* and *Saccharomyces unisporous* and of lactic acid bacteria including *Lactobacillus* spp., *Lactococcus* spp. and *Leuconostoc* spp. included as a mixed culture in kefir grains. Our aim is to develop a fermented beverage based on acid whey produced with kefir starter culture which contains a mixture of yeast and lactic acid bacteria. The probiotic bacteria will be concentrated solely on the genus *Bifidobacterium* and it will not include probiotic species from the genus *Lactobacillus*. Strains of bifidobacteria will be added in specific amounts post fermentation to the final product and the populations will be monitored for survival and viability at the time of inoculation and throughout the product’s shelf life.

**LITERATURE CITED**


