ISSN 1330-7142
UDK = 637.146:613/614

FERMENTED MILK AS A FUNCTIONAL FOOD

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Preliminary communication

ABSTRACT

Certain foods have been associated with health benefits for many years; fermented milks and yoghurt are typical examples. The health properties of these dairy products were a part of folklore until the concept of probiotics emerged, and the study of fermented milks and yoghurt containing probiotic bacteria has become more systematic. Functional foods have thus developed as a food, or food ingredient, with positive effects on host health and/or well-being beyond their nutritional value, and fermented milk with probiotic bacteria has again become the prominent representative of this new category of food. Milk alone is much more than the sum of its nutrients. It contains an array of bioactivities: modulating digestive and gastrointestinal functions, haemodynamics, controlling probiotic microbial growth, and immunoregulation. When fermented milk is enriched with probiotic bacteria and prebiotics it meets all the requirements of functional food. The possible positive effects of enriched fermented milk on host health will be reviewed.

Keywords: fermented milk, probiotics, prebiotics, bioactive peptides, functional food

INTRODUCTION

Inappropriate nutrition is recognised as a primary factor in unachieved genetic potential, reduced mental and physical performance, and increased susceptibility to disease. In searching for effective dietary intervention strategies, a new class of food, functional food, has evolved rapidly and many new terms such as probiotic, prebiotic, nutraceutical and FOSHU (Food for Specified Health Use) have emerged in response.
The term "functional food" originated in Japan in the 1980s, when it was used by the industry to describe foods fortified with specific ingredients imparting certain health benefits (Hilliam, 1998). There are many possible definitions for the term functional food; however, functional food is usually described as food that promotes health beyond the provision of basic nutrition. Head et al. (1996) stated that functional foods could be naturally occurring foods and not just enriched and modified foods. Similarly, Roberfroid (1996) said that a food is functional if it contains a food component that affects one or a limited number of functions in the body in a positive way. However, Pariza (1999) recently proposed a new definition for functional food: "a manufactured food for which scientifically valid health claims can be made". He also explained that "manufactured" refers to a product of human intervention, such as alteration via genetic engineering, as well as conventional food processing practices. He listed three possible forms of functional food:

- A known food to which a functional ingredient from another food is added
- A known food to which a functional ingredient new to the food supply is added
- An entirely new food that contains one or more functional ingredients

The first generation of functional foods involved the supplementation of food with components like calcium, vitamins, carotenoids or antioxidants. In more recent years the concept has moved towards the development of dietary supplementation that may affect gut microbial composition and activity (Ziemer and Gibson, 1998). In addition, new components with putative anti-carcinogenic activity or other specific physiological effects are studied as possible adjuncts to functional foods.

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FUNCTIONAL INGREDIENTS OF FERMENTED MILK

People have consumed fermented milks for several thousand years, and the belief that they are beneficial to health is probably as old. They contain all the nutrients of milk on its own; however, the components are modified during fermentation by lactic acid bacteria (LAB), mainly in a positive way as far as nutrition is concerned.

LACTOSE

Lactose is fermented to lactic acid; this reduces pH, influences the physical properties of casein and thus promotes digestibility, improves the utilisation of calcium and other minerals, and inhibits the growth of potentially harmful bacteria. Because of its lower lactose content, fermented milk can be tolerated by people with a reduced ability to digest lactose (Buttriss, 1997, McBean, 1999).

PROTEINS

The proteolytic activity of LAB gives rise to protein degradation; the result is some free amino acids and bioactive peptides. Bioactive peptides are a frequent supplement to functional foods, and milk proteins are currently the main source of a range of biologically active peptides such as casomorphins, casokinins, immunopeptides, lactoferrin, lactoferricin and phosphopeptides. A lot of milk protein-derived bioactive peptides are inactive within the sequence of the parent protein and can be released by enzymatic proteolysis during gastrointestinal digestion or food processing, e.g. fermentation. The main biological activities of these peptides are immunomodulation, anti-microbial activity, anti-thrombotic activity, blood pressure regulation, and mineral or vitamin binding (Meisel, 1998, Schanbacher, 1998, Tomé and Ledoux, 1998).
Fermented milks are also a rich source of whey proteins such as α-lactalbumin, β-lactoglobulin, lactoferrin, lactoperoxidase, immunoglobulins and variety of growth factors. These proteins have demonstrated a number of biological effects ranging from anti-carcinogenic activity to different effects on the digestive function (McIntosh et al., 1998).

FAT

The digestibility of fat is also improved during fermentation. Milk fat is known for its high proportion of saturated fatty acids; advice is frequently given to avoid it because it contributes to an atherogenic blood profile and increased risk of coronary heart disease. However, one look at the composition of milk fat reveals that of the many different saturated fatty acids in milk only three (lauric, myristic and palmitic) have the property of raising blood cholesterol, and that at least one-third of the fatty acids are unsaturated, with a cholesterol-lowering tendency (Gurr, 1992). Furthermore, fermented milks contain components with at least protective if not hypoholesterolemic effects; these include calcium, linoleic acid, conjugated linoleic acid (CLA), antioxidants, and lactic acid bacteria or probiotic bacteria (Rogelj, 2000). Milk fat contains a number of components, such as CLA, sphingomyelin, butyric acid, ether lipids, β-carotene, and vitamins A and D, with anti-carcinogenic potential (Jahreis et al., 1999, Parodi, 1999a). Numerous *in vitro* and animal studies have confirmed the anti-carcinogenic activity of CLA, as well as its role in preventing atherosclerosis and in modulating certain aspects of the immune system (Cook and Pariza, 1998, MacDonald, 2000).
Fermented milk can be made even "more functional" by adding probiotic bacteria and prebiotics, the supplements that affect gut microbial composition and activity.

PROBIOTICS AND PREBIOTICS

The most common definitions used for probiotics and prebiotics are as follows:

- Probiotics are live micro-organisms that have a beneficial effect on the host by improving its intestinal microbial balance.
- Prebiotics are non-digestible food ingredients that have a beneficial effect on the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon; this can improve host health.

The human gastrointestinal tract possesses an extremely complex microbial ecosystem that can markedly influence various physiological functions of the intestine and, as a consequence, human health. A number of beneficial roles played by probiotic strains have been reported, including: protection against gastrointestinal infections; re-establishment of balanced intestinal microflora; reduction of lactose intolerance; cholesterol reduction; stimulation of the immune system; suppression of allergic reactions in food hypersensitivity; and protection against cancer (Buttriss, 1997, Saxelin, 1997, Parodi, 1999b, Heyman, 2000).

A further possibility in the microflora management procedure is the use of synbiotics, where probiotics and prebiotics can be used in combination. Prebiotics are non-digestible food components, such as carbohydrates, some proteins and peptides found in milk, and certain resistant lipids. The major end-products of fermentation of non-digestible carbohydrates by colonic bacteria are short-chain fatty acids. These acids, along with lactic acid produced by lactic acid bacteria, reduce cancer-promoting factors such as colonic pH and concentrations of ammonia (Gibson and Roberfroid, 1995).

CONCLUSION

Fermented milk provides a wide range of important nutrients and contains different components that affect one or a limited number of functions of the body in a positive way. Increasing scientific evidence confirms that the risk for many of chronic diseases such as cancer, osteoporosis, coronary heart disease and hypertension can be diminished by the regular consumption of fermented milk and fermented milk supplemented with pro- and/or prebiotics. Fermented milks therefore comply with the requirements of functional food.

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