

# Probiotics in Human Diet

K. Gomathy

**Abstract---** Probiotic is a Greek Word which means "For Life". They are beneficial forms of gut bacteria that help stimulate the natural digestive juices and enzymes that keep our digestive organs functioning properly. Most Commonly used microorganisms for probiotics in food are *Lactobacillus acidophilus*, *L. casei*, *Bifidobacterium bifidum*, *B.longum*, *Saccharomyces boulardii*. One of the best probiotic foods is live-cultured yogurt. Goat's milk and cheese are particularly high in probiotics like *S.thermophilus*, *B.bifidus*, *L.bulgaricus* and *L.acidophilus*. Similar to yogurt, kefir is a fermented dairy product which is a unique combination of goat milk and fermented kefir grains. High in lactobacilli and bifidus bacteria, kefir is also rich in antioxidants. Sauerkraut a product made from fermented cabbage (as well as other vegetables), is not only extremely rich in healthy live cultures, but also aids in reducing allergy symptoms. It is also rich in vitamins B, A, E and C. The common green pickle is an excellent food source of probiotics. A great substitute for meat or tofu, tempeh is a fermented, probiotic-rich grain made from soy beans. A great source of vitamin B12, this vegetarian food can be sautéed, baked or eaten crumbled on salads. An Asian form of pickled sauerkraut, kimchi is an extremely spicy and sour fermented cabbage, typically served alongside most meals in Korea. Besides from beneficial bacteria, kimchi is also a great source of beta-carotene, calcium, iron and vitamins A, C, B1 & B2. Thus the probiotic foods serve to maintain the health and nutrition of the human body.

**Keywords---** Probiotic Microorganisms, Nutrition, Health

---

## I. INTRODUCTION

**P**ROBIOTICS are live microorganisms (in most cases, bacteria) that are similar to beneficial microorganisms found in the human gut. They are also called "friendly bacteria" or "good bacteria." Probiotics are available to consumers mainly in the form of dietary supplements and foods. According to the FAO/WHO definition, probiotics are live microorganisms which, when administered in adequate amounts, exert a health benefit on the host [FAO/WHO Report, 2001]. Already in the early twentieth century, in 1908, Eli Metchnikoff, a Nobel Prize winner, emphasised the significance of adequate composition of intestinal microflora for human health. He wrote in his book "Prolongation of life" published in 1907: "The dependence of the intestinal microbes on the food makes it possible to adopt measures to modify the flora in our bodies and to replace the harmful microbes by useful microbes" [Metchnikoff, 1907]. Thus, Metchnikoff associated the condition of human health with the presence of specific microorganisms in the gastrointestinal tract. He paid particular attention to lactic fermentation bacteria present in such products as kefir or yoghurt.

## II. PROBIOTICS AND DIET

Probiotics are available in foods and dietary supplements (for example, capsules, tablets, and powders) and in some other forms as well. Examples of foods containing probiotics are yogurt, fermented and unfermented milk, miso, tempeh, and some juices and soy beverages. In probiotic foods and supplements, the bacteria may have been present originally or added during preparation.

One of the best probiotic foods is live-cultured yogurt, especially handmade. Goat's milk and cheese are particularly high in probiotics like thermophilus, bifidus, bulgaricus and acidophilus. Similar to yogurt, this kefir is a unique combination of goat milk and fermented kefir grains. It is high in lactobacilli and bifidus bacteria, kefir is also rich in antioxidants. Sauerkraut which is a fermented product made from cabbage (as well as other vegetables), is not only extremely rich in healthy live cultures, but also aids in reducing allergy

symptoms. Sauerkraut is also rich in vitamins B, A, E and C. Miso is one the main-stays of Japanese traditional medicine, and is commonly used in macrobiotic cooking as a digestive regulator. Made from fermented rye, beans, rice or barley, adding a tablespoon of miso to some hot water makes an excellent, quick, probiotic-rich soup, full of lactobacilli and bifidus bacteria. Beyond its important live cultures, miso is extremely nutrient-dense and is believed to help neutralize the effects of environmental pollution, alkalinize the body and stop the effects of carcinogens in the system.

Some probiotic foods date back to ancient times, such as fermented foods and cultured milk products. Interest in probiotics in general has been growing; Americans' spending on probiotic supplements, for example, nearly tripled from 1994 to 2003.

Friendly bacteria are vital to proper development of the immune system, to protection against microorganisms that could cause disease, and to the digestion and absorption of food and nutrients. Each person's mix of bacteria varies. Interactions between a person and the microorganisms in his body, and among the microorganisms themselves, can be crucial to the person's health and well-being. .

According to researchers, some uses of probiotics for which there is some encouraging evidence from the study of specific probiotic formulations are as follows:

1. To treat diarrhea (this is the strongest area of evidence, especially for diarrhea from rotavirus)
2. To prevent and treat infections of the urinary tract or female genital tract
3. To treat irritable bowel syndrome
4. To reduce recurrence of bladder cancer
5. To shorten how long an intestinal infection lasts that is caused by a bacterium called *Clostridium difficile*
6. To prevent and treat pouchitis (a condition that can follow surgery to remove the colon)
7. To prevent and manage atopic dermatitis (eczema) in children.

Numerous research studies prove probiotic strains to reinstate the natural appropriately functioning intestinal microflora structure, to inhibit the development of numerous pathogenic microorganisms, reduce the incidence of traveller's diarrhoea, to alleviate the course and to shorten the duration of some bacterial and viral diarrhoeas (*e.g.* caused by *Clostridium difficile*, *Shigella*, *Salmonella*, enterotoxic *Escherichia coli* strains or rotaviruses), to prevent the occurrence or to alleviate the course of diarrhoeas due to antibiotic therapy, to reduce the intensity of radiation diarrhoea, to eliminate or reduce symptoms of lactose intolerance, to have hypocholesterolaemic action, to potentially exert therapeutic action in hepatic encephalopathy, and also to normalise intestinal motility disorders in the elderly.

Also the studies documenting the antagonism of some probiotic strains against *Helicobacter pylori*, bacteria associated with development of gastric and duodenal ulcers, are interesting. Ingestion of probiotic products may be beneficial in the treatment of functional diarrhoea and may shorten the duration of carriage of *Salmonella*. Furthermore, ingestion of probiotic products after antibiotic therapy allows reinstatement of the normal balance of the natural human intestinal microflora (Crittenden, 1999; Rolfe, 2000; Sanders, 2000; Holzapfel and Schillinger, 2002; Saunier and Dore, 2002; Ouwehand *et al.*, 2002; Picard *et al.*, 2005; Reid *et al.*, 2003) . Probiotic bacteria enhance specific and non-specific defence mechanisms of humans and animals.

As evidenced by the studies, daily supplementation of the diet by 10<sup>9</sup>-10<sup>12</sup> cells of probiotic bacteria may result in an increased number of natural killer cells in the blood serum and may increase the activity of macrophages and lymphocytes within only a few weeks. Moreover, immune modulating effects of lactic bacteria may additionally reduce allergic symptoms in children (Kalliomaki *et al.*, 2001, 2003, Cukrowska *et al.*, 2006). The mechanisms of anticancer activity of lactic acid bacteria may be related to stimulation of the human immune system and may result from inhibition of development of bacteria synthesising the enzymes which catalyse intestinal transformation of precursors of carcinogenic compounds into carcinogenic compounds. Furthermore, lactic acid bacteria are able to use (or bind) carcinogenic compounds originating from the diet or created by pathogenic bacteria in the intestines, *e.g.* nitrozoamines, azo dyes, mycotoxins or pyrrolisates of amino acids (Burns & Rowland, 2000; Rafter, 2003). The ability to assimilate cholesterol evidenced under "*in vitro*" conditions is also a very important feature of some lactic bacteria. The importance of these bacterial abilities for humans has not been still documented and undergoes intense studies. It seems

that ingestion of products containing probiotic bacteria may play a role in prevention of atherosclerosis and coronary heart disease (Reid *et al.*, 2003; Salminen *et al.*, 1998; Saunier & Dore, 2002).

Nevertheless, it should be borne in mind that the health effects caused are associated with the specific probiotic strain. Lactic bacteria reduce also lactose intolerance symptoms in humans. Lactose intolerance is a problem affecting many people. In some countries of Africa and Asia it occurs in almost 100% of the population. In Poland it occurs only in about 20-30% of the population. Lactase, an enzyme hydrolysing milk sugar (lactose) to D-glucose and D-galactose, is responsible for lactose hydrolysis in the small intestine. The hydrolysis products can be subsequently easily absorbed by the intestinal walls. In healthy humans, the enzyme hydrolysing lactose is naturally contained in the cells of small intestinal epithelium. In the case of lactose intolerance, we deal with a deficiency of this enzyme arising either from a congenital lactase defect or from enzyme activity lowering progressing with age.

Lactase activity lowering may also be secondary, for example may be a result of some health disorders. Symptoms of lactose intolerance are diarrhoea and flatulence following lactose or milk ingestion. Persons with these disorders are recommended to consume milk products containing a reduced quantity of lactose, which is achieved, for example, by fermentation. In the milk fermentation process, microorganisms convert 20 to 50% of lactose into lactic acid. Furthermore, microbial cells release in the gastrointestinal tract the active enzyme  $\beta$ -galactosidase which hydrolyses lactose in the intestines. Due to increasing awareness of the role of the intestinal microflora system and its importance for the human health, a very intensive development of production of milk drinks fermented with participation of probiotic microflora has been observed in the past few years.

## REFERENCES

- [1] Burns A.J and I.R., Rowland 2000. Anti-carcinogenicity of probiotics and prebiotics. *Curr. Issues Intest Microbiol.*, 1: 13-24.
- [2] Cukrowska B., A.Ceregra and I.Rosiak, 2006. Probiotics in prevention and treatment of atopic dermatitis. *Zakazenia*, 2: 55-60.
- [3] Crittenden R.G., 1999. Probiotics: A Critical Review (ed. G. Tannock). Horizon Scientific Press, UK, pp.141-156.
- [4] FAO/WHO Report, 2001. Health and nutritional properties of probiotics in food including milk with live lactic acid bacteria, Report of a Joint FAO/WHO Expert Consultation. Cordoba, Argentina.
- [5] Holzapfel, W.H and U. Schillinger, 2002. Introduction to pre- and probiotics. *Food Res. Int.*, 35: 109-116.
- [6] Kalliomaki M., S.Salminen, H.Arvilommi, P.Kero, P.Koskinen and E. Isolauri, 2001. Probiotics in primary prevention of atopic disease: a randomized placebo-controlled trial. *Lancet*, 357: 1076-1079.
- [7] Metchnikoff, E., 1907. The Prolongation of Life: Optimistic Studies. W. Heinemann, London. Sanders M.E., Consideration for use of probiotic bacteria to modulate human health. *J. Nutr.*, 130, suppl. 1: 384-390.
- [8] Ouwehand, A.C., S.Salminen and E.Isolauri, 2002. Probiotics: an overview of beneficial effects. *Antonie van Leeuwenhoek*, 82: 279-289.
- [9] Picard C., J.Fioramonti, A.Francois, T.Robinson, F.Neant and C.Matuchansky, 2005. Review article: bifidobacteria as probiotic agents - physiological effects and clinical benefits, *Aliment Pharmacol. Ther.*, 22: 495-512.
- [10] Rafter, J., 2003. Probiotics and colon cancer. *Best Pract. Res.Clin. Gastr.*, 17: 849-859
- [11] Rolfe, R.D., 2000. The role of probiotic cultures in the control of gastrointestinal health. *J. Nutr.* 130(Supl.): 396-402.
- [12] Saunier, K and J. Doré, 2002. Gastrointestinal tract and the elderly: functional foods, gut microflora and healthy ageing. *Digest. Liver Dis.*, 19-24.