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PROBIOTICS, COULD BE FUNCTIONAL FOODS?

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ABSTRACT

Research on functional food (FF) began in the 1980s in Japan, although the term appeared in the journal Nature in 1993. Functional foods can be natural or FF are created via the addition or removal of certain ingredients in technological processes. These treatments are aimed at obtaining food products that have health-promoting effects, including anti-inflammatory and antioxidant effects. The best representative example of functional food is probiotic food. According to World Health Organization (WHO) probiotics are live micro-organisms that, in adequate amounts, provide health benefits to the host. This has the effect of inhibiting the pathogenic bacterium *Escherichia coli* and *E. coli* translocation in the gastrointestinal tract.. In addition, it can also influence the repair of the damaged intestinal barrier. Probiotics can

also improve the host immune system via strong adherence and colonisation of the gut. This results in the secretion of cytokines and chemokines, which are involved in immune processes. More than that, probiotics have the ability to produce peptides directed against microorganisms. These include lantibiotics, bacteriolysins and peptide bacteriocins. The review presented shows that probiotics as functional foods have an important role in human health. Their intake has many benefits and their appropriate use can significantly improve the comfort of a person's life.

Keywords: functional foods; probiotics; diet

As knowledge about the impact of diet on human health increases, many nutritional trends are developing. Foods that provide the body with additional benefits beyond the standard nutrients - it is functional food (FF) (Alkhatib et al. 2017). Research on FF began in the 1980s in Japan, although the term appeared in the journal Nature in 1993 (Arai 1996, Swinbanks and O'Brien 1993). Functional foods can be natural or FF are created via the addition or removal of certain ingredients in technological processes (Castillo et al. 2018). These treatments are aimed at obtaining food products that have health-promoting effects, including anti-inflammatory and antioxidant effects (Serafini i Peluso 2016).

The best representative example of functional food is probiotic food. According to World Health Organization (WHO) probiotics are live micro-organisms that, in adequate amounts, provide health benefits to the host. In humans, the most commonly given probiotics are strains of *Lactobacillus* spp., *Bifidobacterium* spp. czy *Enteroccoccus* spp. (Bernardeau i Vernoux 2013). The greatest source of probiotics is dairy, mainly yoghurt, buttermilk and cheese, due to the low pH in which the bacteria can survive (Anandharaj et al. 2020). It appears that probiotic microorganisms can also be found in non-dairy products, e.g. grains, leguminous plants and maize (Fontana et al. 2013). Several criteria must be fulfilled for a probiotic to be approved for use in humans. The strains must be identified to family, genus and species, must not be pathogenic and should be food safe. In addition, the bacteria must survive passage via the gastrointestinal tract and have the ability to adhere to the surface of the intestinal mucosa (Borchers et al. 2009).

Probiotics have many important functions for the human body. One of these is the strengthening of the intestinal barrier. This occurs due to probiotics enhancing the production of mucins, which are part of the mucus that protects the intestinal surface. This has the effect of inhibiting the pathogenic bacterium *Escherichia coli* and *E. coli* translocation in the gastrointestinal tract. (Hardy et al. 2013). In addition, it can also influence the repair of the damaged intestinal barrier (Goudarzi et al. 2014). Probiotics can also improve the host immune system via strong adherence and colonisation of the gut. This results in the secretion of cytokines and chemokines, which are involved in immune processes (Hemaiswarya et al. 2013). More than that, probiotics have the ability to produce peptides directed against microorganisms. These include lantibiotics, bacteriolysins and peptide bacteriocins (Saulnier et al. 2009). It is also worth noting that probiotics are involved in the modulation of the immune system, non-specific and specific responses - it increase the phagocytic function of macrophages, stimulate the formation of IgA class antibodies and increase the expression of NK cells (Natural Killers) (Delcenserie et al. 2008, Yaqoob 2014). Probiotic microorganisms can also reduce or completely exclude pathogenic bacteria. This is due to the production by probiotics of unfavourable conditions for pathogenic microorganisms, e.g. low pH and the production of organic acids (Brown 2011).

Probiotics have the potential to improve health in many clinical conditions through the mechanisms presented in this article. Their main role is considered in intestinal diseases (Kim et al. 2019). The use of probiotics during antibiotic therapy inhibits the proliferation of

pathogenic microorganisms, which may reduce the risk of post-treatment diarrhoea (Kechagia et al. 2013). There is evidence of similar effects of probiotics also in diarrhoea caused by viruses, mainly rotavirus, and in travellers' diarrhoea caused by bacteria *Escherichia coli* (Kechagia et al. 2013, Guarino et al. 2009). Probiotics have an important role in *Irritable Bowel* Syndrome (IBS) and Inflammatory Bowel Disease (IBD), which include Crohn's disease and ulcerative colitis. Probiotic intake in these clinical conditions has been shown to result in a reduction in the severity of symptoms associated with these diseases (Hoveyda et al. 2009, Maurya et al. 2014). Some probiotic bacterial strains have also been proven to have higher lactase activity, which can help break down lactose in people with lactose intolerance (Kechagia et al. 2013). In addition, probiotics are involved in reducing allergic reactions by modulating the immune system (Kechagia et al. 2013), prevent infections of the respiratory tract and the urinary tract (Fontana et al. 2013, Stapleton et al. 2011), and also influence metabolism, e.g. by lowering blood cholesterol levels (Mishra et al. 2015). There are also research that have shown an anti-cancer effect of probiotics. Lactic acid bacilli can have a beneficial effect on the formation, growth or metastasis, particularly in colorectal cancer (Ucello et al. 2012).

The review presented shows that probiotics as functional foods have an important role in human health. Their intake has many benefits and their appropriate use can significantly improve the comfort of a person's life.

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