Probiotics conventional benefits and cautions in intake- A review

G. Priya Sugandhi*

Department of Foods and Nutrition, The Professor Jayashankar Telangana State Agricultural University, Krishi Vigyan Kendra, Wyra-507 165, Khammam, Telangana, India.

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ABSTRACT

Probiotics are friendly bacteria benefit the health which occur naturally in the digestive tract of human beings. Prebiotics, act as 'food' for these beneficial probiotic bacteria, promoting their activity. Lactobacillus and Bifidobacterium are widely used probiotics which generally regarded as safe. They are adhesive to mucosal and epithelial surfaces and enhance immunity by preventing pathogen adhesion in the digestive system. Although infections with probiotics are very rare, few research studies have been reported in children and also in elderly suffering from diseases due to supplementation of few types of species which may be due to immunodeficiency and immunosuppression. The familiarity of probiotics is still uncertain in many and they doubt whether to consume or not. This review provides the information based on research studies and gives clarity on the intake of probiotics. However, caution need to be exercised in the selection of genus and strains of particular probiotics genera.

Key words: Benefits of probiotics, Cautions in intake of probiotics, Infections.

The definition of probiotics given by World Health Organization (FAO/WHO, 2001) as “live micro-organisms which, when administered in adequate amounts, confer a health benefit on the host”. Probiotics not only aid the gut by increasing the number of beneficial bacteria and inhibiting harmful bacteria but also strengthen the body’s immune response. Prebiotics, act as ‘food’ for these beneficial probiotic bacteria, promoting their activity. The combinations of pre- and probiotics are called symbiotics as both work together in a synergistic manner to enhance the probiotic benefits. Lack of knowledge and unfamiliarity of probiotic yoghurts has led to non-acceptability of the product by elderly despite exhibiting their health benefits (Sugandhi and Maheswari, 2016). Since the familiarity of probiotics’ benefits is still uncertain in many people and developing countries with an apprehension for consumption. This review focus the health benefits and cautions of probiotics to give the clarity on consumption.

Lactobacillus and Bifidobacterium are widely used as probiotics. Probiotics are also be taken in supplement form as pills or capsules. Recently, other probiotic functional food products have been introduced which include probiotic fruit juice, cereal and probiotic fruit smoothies (non-dairy) etc. Dairy products play a significant role in the functional food market which carries probiotics, prebiotics and symbiotics.

One of the dairy probiotic product - yoghurt consumption promotes not only the alteration of the microbial flora of the intestine but also contain probiotics that helps to recognize harmful microorganisms causing intestinal infections (Amanda, 2013). Research on probiotics has focused on various aspects such as growth, gut- disorders, heart diseases, allergic reactions, HIV and cancer. Modulation of the gut-brain by probiotics has been suggested as a novel therapeutic solution for anxiety and depression (Shi et al., 2016). A probiotic treatment with S. thermo phi lus and Enterococcus faecium reduced low density level (LDL) “bad” cholesterol by about 8% in 70 overweight people in an 8-week, double-blind, placebo-controlled trial (Agerholm-Larsen, 2000). Several small-scale clinical trials have indicated that consumption of milk fermented with various strains of lactic acid bacteria may result in modest reduction in blood pressure. Many human trials have shown that the strains tested may exert anti-carcinogenic effects by decreasing the activity of an enzyme called α-glucuronidase, which generate carcinogens in the digestive system. Age-related changes in the gastrointestinal tract combined with changes in diet and immune system reactivity affect the composition of gut microbes, leading to increased numbers of facultative anaerobes, decreased number of beneficial organisms like anaerobic Lactobacilli and Bifidobacteria. Andersen and Baumgart, (2006) reported that probiotics have shown beneficial effects both in acute infectious diarrhea and inflammatory bowel disease and thus presumably be of potential benefit in post-infectious irritable bowel syndrome (IBS). Since lactic acid bacteria (LAB) are general inhabitants of the human genital tract, they have been controlled by supplementation of probiotics (either orally

*Corresponding author’s e-mail: priya.sugandhi777@gmail.com
or locally administrated) for urogenital infections (Oberoi, 2007). Bacterial vaginosis is considered as an overgrowth of anaerobic organisms. Daily oral intake of probiotic strains, resulted in asymptomatic bacterial vaginosis patients reverting to normal Lactobacilli dominated vaginal microflora (Menard, 2011).

**Immune system:** The sensitivity of the immune system decreases with age, a process known as immune-senescence (Wardwell et al., 2008), which is characterized by decreased proliferation of T-lymphocytes and impaired T-helper activity that may lead to impaired cell-mediated immune defense (Volkert, 2005). This can make the older people more susceptible to infections - the fourth most common cause of death in old age (Chandra, 2004), less ability to fight against the diseases that reduce the effectiveness of vaccination (Martin, 2000), while low cholesterol levels have been associated with improved immune function (Tufts, 2003), enable people to make dietary changes in health improvement.

Probiotics increase the immunity through targeting cells. Ying et al. (2001) reported that the degree of specific target cell lysis by NK cells increased significantly following consumption of HN001 in either low fat milk (LFM) or LFM-LH low fat milk and lactose-hydrolyzed LFM. Oral delivery of *L. rhamnosus* HN001 in a milk base can enhance indices of natural immunity in middle-aged and elderly consumers, but that delivery of the probiotic in an oligosaccharide-enriched milk base does not appear to strongly potentiate the immunomodulatory effects. The effect of probiotic supplementation of *L. salivarius* over 16-wk period with upper respiratory tract infection (URTI) symptoms in 54 highly active individuals showed significant effect for B-cells (CD3+ CD4+), with higher values on probiotic than placebo, but not for lymphocyte subset (T-, T-cytotoxic and B-cells) counts indicating strain specific effects (Gleeson et al., 2012). Whereas, significant increment of CD4 cells was observed with probiotics, prebiotics and symbiotics in HIV infected population (Ray and Vaidya, 2014). Oral administration of *Lactobacillus casei* DN-114001 alleviated colitis and increased the suppressive function of FOXP3 CD4 regulatory T-cells of colon lamina propria. These studies have a great bearing on the effects of probiotics with natural adjuvant on mucosal regulatory T-cells may represent a valuable approach to alleviate the colitogenic effect of Tcl-type CD8+ effectors (Rachin et al., 2009).

**Gastrointestinal tract:** Age-related changes in the gastrointestinal tract combined with changes in diet and immune system reactivity affect the composition of gut microbes, leading to increased numbers of facultative anaerobes and decreased number of beneficial organisms (anaerobic *Lactobacilli* and *Bifidobacteria*). Bezkorovainy (2001) overviewed that an ideal probiotic can survive passage through the gastrointestinal tract, establish itself permanently in the small intestine and colon and provide a specific health benefits for the host by eliciting an immune response; secretion, production, and synthesis of compounds such as short-chain fatty acids, lactic acid, and bacteriocins or another appropriate mechanism.

**Irritable bowel syndrome:** Probiotics have also been shown to exhibit a beneficial effect both in acute infectious diarrhea and inflammatory bowel diseases and thus could presumably be of potential benefit in post infectious irritable bowel syndrome (IBS) (Andersen and Baumgart, 2006). Adequate probiotic supplementation can improve the intestinal barrier function, redox hemostasis and low-grade inflammation in men, under sustained exercise stress (Lamprecht et al., 2012).

Several clinical symptoms have been reportedly treated with probiotic supplementation. Diarrhea, gastrointestinal infections, irritable bowel syndrome and inflammatory bowel disease (IBD; Crohn’s disease and ulcerative colitis) which are digestive tract infections. Inadequate lactase digestion, infant allergies, failure-to-thrive in children, hyperlipidemia, hepatic diseases, *Helicobacter pylori* infections, cancer and depressed immune function (Parvez, et al., 2006) are treated with probiotics along with medication. Gulyanet et al. (2007) studied the effects of fermented milk containing *Bifidobacterium animalis* DN-173 010 and yoghurt strains on IBS. He found that decrease in bloating score at week 3 in the test vs. the control group and in those subjects with <3 stools/week, stool frequency increased (P < 0.001) over 6 weeks in the test vs control group. Gibson, et al. (2010) over reviewed that the probiotic field is currently dominated by gastrointestinal events.

**Infections:** Infections with probiotics are scanty based on research studies. Strains of the *Lactobacillus* and *Bifidobacterium* genera are usually regarded as safe following long-term use in human beings. Anuradha and Rajeshwari (2005) reviewed cases of infection due to *Lactobacilli* and *bifido bacteria* are extremely rare and estimated to represent 0.05 - 0.4% of cases of infective endocarditis and bacteraemia not only that the risk of bacteraemia is < 1 case per million individuals but also virtually impossible to propose a risk of death because of the common association of infections involving lactobacilli with fatal underlying conditions or the presence of poly microbial infections. Weston et al. (2005) demonstrated that *Lactobacillus* species beneficial effects of decreasing severity of atopic dermatitis among children <2 yr old.

Leyer et al. (2009) conducted a study on a total sample size of 326 children for detection of a minimal difference of 20% to 40% in the incidence of influenza-like symptoms (fever, rhinorrhea and coughing) between the placebo group and each probiotic group and found subjects receiving probiotic products had significant reduction in days absent from group child care, compared with subjects.
receiving placebo treatment. Daily probiotic dietary supplementation during the winter months was a safe effective way to reduce episodes of fever, rhinorrhea and cough, the cumulative duration of those symptoms, the incidence of antibiotic prescriptions and the number of missed school days attributable to illness.

Increasing dietary fiber with the use of probiotic or prebiotic supplements or functional foods have been suggested to improve digestive and immune health in older people (Donini et al. 2009; Gage, 2009; Arthur, 2009). Allen et al. (2011) assessed the effect of probiotics in acute infectious diarrhea among infants and young children and found probiotics appear to be safe and have clear beneficial effects in shortening the duration and reducing stool frequency in acute infectious diarrhea.

Though more common probiotics from the genera of Lactobacillus or Bifidobacterium are generally regarded as safe, it should not be concluded that all members of Bacillus genera such as Bacillus licheniformis which is also been used in investigations can be used as probiotics. This is due to association of some strains of Bacillus genus with diseases such as Bacillus cereus which can cause food-borne illnesses (EFSA, 2007; Leuschner et al. 2011). The important area of concern with probiotic use is the risk of sepsis. Bacterial sepsis related to probiotic use in children has also been reported by Kunz et al., (2004) in the cases of 2 premature infants with short gut syndrome who were fed via gastrostomy or jejunostomy and developed Lactobacillus bacteremia while taking LGG supplements. But LGG and other strains of L. rhamnosus can sometimes be found in the intestinal microbiota of healthy humans, so the source of infection in these cases is not conclusively proven (Boyle et al., 2006).

CONCLUSION
There is strong evidence for use of probiotics in preventing and treating some human diseases. Probiotics aid the gut by increasing the number of helpful bacteria but inhibiting the harmful bacteria by strengthening the immune response. They are introduced to the human body during birth which protects from infections, deficiencies. There are also cautions to select the genus and strains of particular probiotics genera and should be used after evidential trials because of the risk of sepsis. The probiotic approach, i.e. therapeutically consuming beneficial microorganism cultures of the healthy human microflora, holds great promise for the prevention and treatment of clinical conditions associated with impaired gut mucosal barrier functions and sustained inflammatory responses. However, more proven studies showed intake of probiotics gives health benefits with adequate, safety strains, species of probiotics.

REFERENCES
AGRICULTURAL REVIEWS


