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Availability of Prebiotic and Probiotic Foods at Household and Commercial Level: Constraints Ahead for Health

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Abstract: ***Prebiotics are a very special form of dietary fibre while probiotics are living bacteria intended to benefit colon health. Regular intakes of probiotics and prebiotics have an enhanced effect on immune infections, colonic integrity, decreased incidence of intestinal infections, improved digestion, elimination and much more. Research has shown that both probiotics and prebiotics may be useful in achieving these positive effects depending upon the selection of proper product, strain and dosing guidelines of commercial and household products rich in both. Foods like idlis, dosas, lassi etc are some of the lactobacillus fermented cereals and legumes that are commonly consumed at household level while products like yogurt, kefir, buttermilk, sour cream, milk and soy products like tofu, soy milk, beer etc. prepared at commercial levels are probiotic rich foods. The two most common subtypes of prebiotics are the closely related inulins and fructo- oligosaccharides, or FOS and galacto –oligosaccharides (GOS) which are synthesized from lactose. Prebiotic rich foods at household level include oats, barley, broccoli, brussels sprouts, cauliflower etc. While commercial products like fermented dairy products breakfast cereals, sauces, soups, sports drinks, snack bars etc. contains GOS.The role of probiotics has been found to work efficiently inGIT conditions., while other health problem such as gingivitis, periodontitis and also reduce the side effects associated with treatment for helicobacterpylori infection ,while the prebiotics having an optimal 'gut' microflora increase resistance to pathogenic bacteria, lower blood ammonia increase stimulation of the immune response and reduce the risk of cancer***

Keywords: prebiotics, probiotics, health

1. Introduction

1.1 What are Probiotics and Prebiotics?

The growing awareness of the relationship between diet and health has led to an increasing demand for food products that support health above and beyond providing basic nutrition. Probiotics and prebiotics are components present in foods, or that can be incorporated into foods, which yield health benefits related to their interactions with the gastrointestinal tract (GI). While the benefits of prebiotics have come to light in more recent years, recognition of probiotic effects dates back to the 19th century when the French scientist Louis Pasteur (1822 –1895) postulated the importance of microorganisms in human life; this was further reinforced by work done by 1908 Nobel Prize-winner Elie Metchnikoff.

A probiotic has been defined as _a live microbial food ingredient that is beneficial to health **(Aggett, 1999)**. The most studied probiotics belong to the genera of lactobacilli and bifidobacteria. They have proved to be safe within the fermented food industry and also recently in the probiotic foods. Whereas a Prebiotic food is a —an digestible food ingredient that beneficially affect the host by selectively stimulating the growth and activity of one or a limited number of bacteria in the colon and thus improves host health **(Gibson, 1995)**. Probiotics are found in foods such as yogurt, while prebiotics are found in whole grains, bananas, onions, garlic, honey and artichokes. In addition, probiotics and prebiotics are added to some foods and available as dietary supplements.

Probiotic microorganisms can be found in both supplement form and as components of foods and beverages. These bacteria and yeasts have been used for thousands of years to ferment foods. Certain yogurts and other cultured dairy products contain such helpful bacteria, particularly specific strains of Bifidobacteria and Lactobacilli **(Adolfsson, 2004)**. Not all bacteria present in fermented milk products or yogurt have a probiotic effect. For this reason, in order to consider a Lactobacillus or Bifidobacterium a probiotic, the specific strains selected must exert a clinically established health benefit **(Piccard, 2005).**

Prebiotics are found naturally in many foods, and can also be isolated from plants (e.g., chicory root) or synthesized (e.g., enzymatically, from sucrose). A food ingredient is classified as a prebiotic only if it:

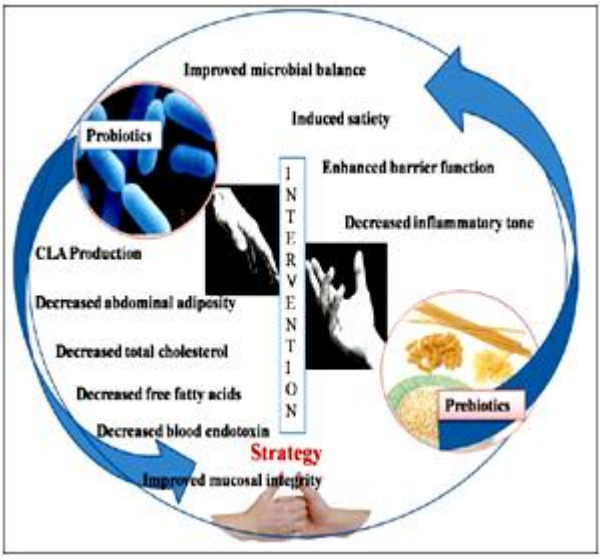
a) Is not broken down in the stomach or absorbed in the GI tract,
b) Is fermented by the gastrointestinal microflora; and
c) Most importantly, selectively stimulates the growth and/or activity of intestinal bacteria associated with health and wellbeing**.(Gibson,1999).**

Examples of Probiotics and Prebiotics		
Class/component	Source	Potential benefit
Probiotics		
Certain species and strains of *Lactobacilli*, *Bifidobacteria*, Yeast	Certain yogurts, other cultured dairy products, and non-dairy applications	improve gastrointestinal health and systemic immunity
Prebiotics		
Inulin, Fructo-oligosaccharides (FOS), Polydextrose, Arabinogalactan, Polyols—lactulose, lactitol	Whole grains, onions, bananas, garlic, honey, leeks, artichokes, fortified foods and beverages, dietary supplements and other food applications.	improve gastrointestinal health; improve calcium absorption -

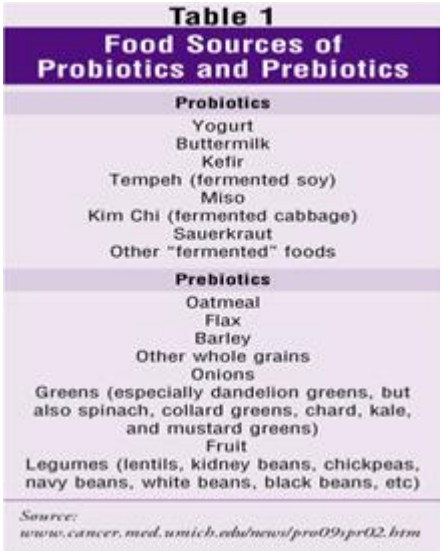
Source: International Food Information Council Foundation: Media Guide on Food Safety and Nutrition: 200 4-2006

1.2 Health effects of Probiotics and PrebioticS

Probiotics have shown a very compelling evidence of its efficacy on the anti-diarheal effects and stool regularity. In the case of yogurt containing sufficient amounts of live and active yogurt cultures (Streptococcus thermophilus and Lactobacillus bulgaricus), there is significant evidence for the alleviation of the symptoms associated with lactose intolerance **(Gibson, 1999).** Two lactobacillus strains have showed a significant effect on the improvement of acute rotavirus diarrhea **(Rosenfeldt, 2002).** In studies of children attending day care centers, changes in severity and duration of diarrhea after consumption of specific strains, were also seen **(Pedone,2000).** A meta-analysis of 18 studies also reported that bacterial probiotic therapy shortened the length of acute diarrheal illness in children **(Huang, 2002)**.



Consumption of probiotics, particularly certain species of Bifidobacteria and Lactobacilli, can help –balance" the flora, increasing the number of helpful, and reducing (inhibiting the growth of) harmful bacteria, in the intestine. Consumption of probiotics can also modify the gut immune response and improve its barrier function. For example, specific probiotic species can shorten or reduce the risk of certain infections, particularly those of the GI tract, such as intestinal viruses **(Ashwell, 2002).** More recently, probiotics have also been shown to modulate/adjust the activity of the immune system, helping to control or reduce the development of certain allergies.



Prebiotic effects on mineral absorption have been investigated, and recent human studies have confirmed that specific prebiotics, such as non-digestible oligosaccharides (NDOs) enhance calcium absorption.(Scholz,2001) However, this effect varies according to the individual NDO and particular human population studied, and is thought to be due to its specific fermentation profile and the amount consumed **(Saggiro,2004).** Preliminary studies suggest that prebiotics may have a favourable effect on the immune system and provide improved resistance against infection **(Saavendra, 2002).** While some of the pro- and prebiotic beneficial effects on the function of the human gut have been established and their favourable impact on health widely supported, further scientific research is ongoing to substantiate their direct relationship to disease risk reduction **(Roberfroid, 2000).** Further, studies have shown that oral administration of the prebiotic combination long chain inulin and oligofructose significantly reduces the development of colitis and prevented arthritis **(Frank, 2005)**. Changes in the gut microbiota composition, especially growth promotion of endogenous beneficial bacteria induced by prebiotics, may contribute to colitis and arthritis prevention.

2. Availability of Probiotic and Prebiotic Foods at Household Level:

Probiotics are considered good bacteria. The good bacteria deter the growth of harmful bacteria in your digestive system, which keeps it healthier. Prebiotics are carbohydrates that the human body cannot properly digest.

Probiotics feed off prebiotics. The maintenance of balance seems to keep the digestive system on track and healthy.

Probiotics are beneficial forms of gut bacteria that help stimulate the natural digestive juices and enzymes that keep our digestive organs functioning properly.One of the best probiotic foods is live-cultured yogurt, especially handmade. Yoghurt made from goat milk that have been infused with extra forms of probitoics like lactobacillus or acidophilus. Goat‘s milk and cheese are particularly high in probiotics like thermophillus, bifudus, bulgaricus and acidophilus. Similar to yogurt, kefir a, fermented dairy product is a unique combination of goat‘s milk and ferment ed kefir grains. High in lactobacilli and bifidus bacteria, kefir is also rich in antioxidants. The majority of researches have shown the potential benefit of consumption of fermented dairy products that contain lactic acid bacteria **(Deeth and Tamime 1981).**

Prebiotics are non-digestible carbohydrates that act as ―dod‖ for probiotics. Prebiotics help probiotics grow and remain in our digestive system. Prebiotic fiber is found in many fruits and vegetables, such as the skin of apples, bananas, onions and garlic, Jerusalem artichoke, chicory root and beans. Both bananas and berries provide you with prebiotics. These fruits are good sources of fiber and also contain other essential nutrients, such as the high amounts of potassium in bananas and vitamin C in berries. A number of vegetables provide prebiotics, including jicama, artichokes, asparagus, garlic, leeks, onions, chicory root, Jerusalem artichokes and dandelion greens, as well as other leafy greens. These foods are all low in energy density, they don't contain many calories per gram, so consumption of more vegetables increases prebiotic content eithout increasing calorie intake. Grains including rye, barley, flax seeds and oatmeal also provide prebiotics. Whole grains are better sources than refined grains, since they contain more fiber, and as such, more prebiotics. Dietary fiber is an indigestible carbohydrate provided by plant-based foods. One type, called soluble fiber, dissolves in water to form a gel. It's especially rich in prebiotics called fructo-oligosaccharides, which includes compounds called inulin and oligofructose. These compounds are not broken down by stomach acid or digestive enzymes but are fermented and used by beneficial bacteria in the colon, especially two types called lactobacillus and bifidobacter. Natural sources of these prebiotics include almonds, bananas, apples and vegetables such as Jerusalem artichokes, wild yams, jicama, leeks, asparagus, chicory, garlic and onions. Legumes such as soybeans are also high in prebiotics, as are whole-wheat, whole-grain oats and corn, along with made with these whole grains. Another type of prebiotic compound is called galactooligosaccharide, or GOS. It's a natural component of human breast milk that helps get a newborn's digestive tract off to a good start by providing nutrition for the baby's colonies of beneficial intestinal bacteria. It also helps prevent pathogenic bacteria from attaching to the lining of the baby's tract. GOS is especially beneficial for bifidobacter colonies in the colon,

3. Availability of Probiotic and Prebiotic Foods at commercial Level:

The increased demand for functional foods in recent years is closely related to the growing concern of society with health and quality of life. Moreover, consumers are more informed and aware about the foods that can benefit health. Probiotic therapy is becoming increasingly common in veterinary and human medicine, and numerous probiotic products are now available commercially. A recent study conducted at for AAU, Gujarat reported that two probiotic cultures have been Developed indigenously for supplements a nd dairy products and are now made available for commercial use, "Isolated in 1990 and tested in the last 20 years, the first two indigenous probiotic cultures from India- Lactobacillus helveticus MTCC 5463 and Lactobacillus rhamnosus MTCC 5462--are now available to the industry for probiotic products manufacture**," (the economic times, 2012).** Worldwide, a diverse array of probiotic products is on the market. Yogurt is perhaps the most common probiotic-carrying food, but the market has expanded beyond yogurt. Cheese, fermented and unfermented milks, juices, smoothies, cereal, nutrition bars, and infant/toddler formula all are food vehicles for probiotic delivery. In addition to being sold as foods, probiotics are sold as dietary supplements, medical foods, and drugs. The consumption of foods that have been fortified with probiotics promote helath beyond nutrition, various food products like soy-based ice cream, sports bars, calcium fortified orange juice etc. have taken over the market as well as the choices of people. a study conducted on the children of day care centres in Finlan d founded that children provided with The *Lactobacillus* milk that contained 1% fat and $5\text{-}10x10^5$ colony forming units/ml of strain *Lactobacillus rhamnosus* GG (ATCC 53103) reduces respiratory infections and their severity among children in day care **(Hatakka,2001)**. Studies done so far have shown that most of the probiotic products contain bacteria from the genera *Lactobacillus* or *Bifidobacterium*,althoughothergenera,including *Escherichia*, *Enterococcus*, *Bacillus*, *Propionibacterium* and *Saccharomyces* (a yeast) have been developed as probiotics. Refrigerated storage of dairy products helps promote probiotic stability. Although the lactic acid content of yogurt can be a barrier to culture stability, short-term refrigeration generally promotes stability. Modern research has suggested healthful properties of fermentation-derived peptides and butyric acid found in some dairy products.

Prebiotics are substances that can promote the growth of beneficial microorganisms, mainly in the intestinal tract, and will modify the colonic microbiota. Given the many benefits purported to be associated with the intestinal microbiota present in breastfed infants, it is not surprising that researchers are interested in determining ways to promote similar microbiota in formula-fed infants. The addition of prebiotics to infant formula has the potential to mimic some of the beneficial effects of HMOS in formula-fed infants. One goal of using prebiotics in the diet is to modify the intestinal microbiota such that their beneficial activities are enhanced and detrimental activities suppressed. Several industrial products containing added prebiotics can be found in the consumer market: dairy products, breads, fruit juices, margarine, pasta, dairy desserts, ice creams, cereals, milk,

yogurt, biscuits, soft drinks in general, isotonic drinks, liquid sugar and modified sugar, chocolates and candies in general.

4. Conclusion

The healthful effects of pre- and probiotics factor in their potential impact on the balance of the body‘s microflora, and directly or indirectly in their enhancement of the function of the gut and systemic immune system. Although benefits vary, depending on the type and amount of a pre- or probiotic consumed, experts agree that daily consumption of foods containing these functional components is beneficial. In addition, effects of probiotics are strain-specific and must be demonstrated through appropriate clinical trials.The administration of prebiotics reduces blood lipids and blood pressure, increases the synthesis and absorption of nutrients and has anti-carcinogenic action. In addition to its functional properties, prebiotic show interesting properties that have implications for the food processing industry and the content of its end-products. The proper administration of prebiotics consists of following the recommended daily intake, which should be specific to the pathology indicated and at levels that do not cause side effects. People who eat yoghurt have a probiotic in their diet. Others eat foods that contain FOS and thus have a prebiotic in their diet. So it is possible to eat a probiotic that contains a prebiotic. Thus including each of them provides a tack for updating an individual‘s health overall.

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