

A Review of Prebiotics

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ABSTRACT: Human eats the food to get the nutrition and energy for the body to keep himself/herself healthy and working. But a balance of nutrition is always required for the proper working and healthiness of the body and for that food should be digested properly and this happens in the gut of the human. In the gut some beneficial bacteria are required which perform this function and these bacteria feed on some specific foods which is known as the prebiotics. Prebiotics acts as the substrate for the beneficial bacteria present in the gut of the human and thus helps in promoting the strength of the beneficial bacteria. Prebiotics also helps in the reduction of the harmful bacteria and also prevents the human from the diseases. In this paper the study has been focused on the prebiotics and will be helpful to understand the importance of the prebiotics and the food products possessing the prebiotics properties.

KEYWORDS: Bacteria, Gut, Intestine Nutrition, Prebiotic, Substrate.

INTRODUCTION

Prebiotic word was first coined by Gibson and Roberfroid in the year 1995 and defined it as “the non-digestible food ingredient that positively creates its impact on the host by selectively promoting the growth or the activity of one or a number of bacteria in the colon and thus improving the health of the host. In simple words, the species of the bacteria which helps in improving the health and act for the wellbeing of humans use prebiotics as the food. The fermentation features choosing food as prebiotic should include the nutraceutical effects that extend beyond the need of the daily nutrition. More such effects deal with the optimized colon functions and process of the metabolism which includes the increase in the expression or alteration of the composition of the short chain fatty acids (SCFAs), increase in faecal weight, slightly decrease in the pH of the luminal colon, decrease in the end products of the nitrogenous end products and the reductive enzymes, increase in the active carriers related to the mineral absorption and the immune system regulation. On the basis of the fermenting ability only various foods can be classified into prebiotics due to the presence of the various types of fibers which can be fermented.

Different kinds of micro-organisms reside inside the gastro-intestinal tract of the human beings and these are known as the gut microbiota. They are in tremendous amount and approximately 10^{10} - 10^{12} active or live micro-organisms can be found in one gram of the colon of the humans. The microbial groups present in the stomach, large intestine and the small intestine of human beings are very important for their health. The major portion of these micro-organisms mainly anaerobes can be found in the large intestine. Some endogenous secretions like the mucin secretions affect the balance of microbes and human food is the ample source of energy for their growth. Specifically, the non-digestible carbohydrates.

Function of the prebiotics

Due to the chemical nature of the prebiotics, prebiotics reaches the colon without getting digested. That portion of the food material which is not digested by the pancreas and the small bowel enzymes reaches the large bowel. The whole length of the human intestine is occupied by the microorganisms with population numbers[1]. In the gut of human beings, the more stable colonies can be found in the large intestine than in the small intestine. Large microbial colonization and the growth is supported by the colon due to the low absorptive nature and pH value of the colon. Due to this micro bacterial activity the colon undergoes complex hydrolytic functions for the process of digestion. So it leads to the breaking of the food components, complex carbohydrates and some proteins which cannot be absorbed in the upper digestion tract. The micro bacteria of the colon take their food from the undigested food. For example, undigested oligosaccharides, fiber and undigested proteins. These bacteria also get their food from the mucin which is the glycoprotein found in the mucus. Therefore, any undigested food reaching the colon is a major source of the prebiotics. These prebiotics has many health benefits for the human beings. It acts as the food for the beneficial intestinal micro-organisms. The various benefits are:

Gastroenteritis

This is a very common disease which occurs due to the pathogens or due to their released toxins infected indigested food. Pathogens responsible for this disease are *C. perfringens*, *Shigellae*, *E. coli*, *Salmonellae*, *V. Cholera*, *C. jejuni*, *Y. enterocolitica*. Before the ingestion of food these pathogens grow in numbers and colonize the tract of the gastrointestinal and invade the host tissues by secreting their toxins[2]. Such toxins halt the functions of the intestinal mucosa causing diarrhea, nausea and the vomiting. But prebiotics helps to fight with these toxins or pathogens by helping to increase the population of the useful gut bacteria in the large bowel that ultimately help to prevent the disease of gastroenteritis.

Inflammation of the bowel

It is related to the infection in the intestine by the microbiota pathogens. The way to treat this disease is the intake of the prebiotics. Some other diseases associated with the prebiotics are as follows as shown in Table 1[3][4].

Table 1: Diseases related to the prebiotics

Allergy	Cancer	Bone mineralization	cardiovascular
Crohn's disease	Necrotizing enterocolitis	Colorectal cancer	Irritable bowel syndrome
Ventilator associated pneumonia	NAFLD	Colitis	Mental behaviors

Prebiotics in foods

As prebiotics are the kinds of the dietary fiber that provides nutrition to the friendly bacteria in the intestine and promotes the gut bacteria to produce the nutrition for the colon cells and thus producing a healthier digestive system. These nutrients contain short chains of fatty acids like propionate, butyrate and acetate. These fatty acids are dissolved into the blood stream and thus improves the metabolic health of the human being. Following are the foods containing prebiotics:

Chicory Root

It is popular due to its coffee like flavor and a rich source of prebiotics. 47 % of the chicory root fiber can be obtained from the inulin[1]. Inulin provides nutrient to the gut bacteria which helps in relieving the constipation and the digestion. Thus it helps in promoting the bile production leading to the digestion of the fat in an easy manner. More-over it contains large amount of antioxidant compounds that protect the liver from oxidative damage. It contains no caffeine.

Dandelion Greens

These are used in the salads due to their high content of fiber containing 4% fiber per serving. Major portion of the fiber comes from the inulin. Like in chicory root inulin fiber in this too help in relieving from the constipation problems and promotes the friendly bacteria in the gut and boosts the immune system of the host. Dandelion acts as a diuretic, anti-cancer, anti-inflammatory, cholesterol reducing and antioxidant properties. Overall it helps to improve the immunity system.

Jerusalem Artichoke

It is also called as the “Earth Apple” having very much health benefits. It contains 2% fiber per 100 gm of the serving out of which 76% is derived from the inulin. It is known to even better promotion of the useful bacteria in the colon than the chicory root. Overall it also helps in strengthening the immune system and provide immunity against the metabolic disorders also. It is rich in thiamine and potassium beneficial for the nervous system and promoting the muscular functioning.

Garlic

It is a very tasty herb having immense health benefits. 11% of the fiber of the garlic is derived from the inulin and 6 % is derived from the sweet known as fructo-oligosaccharide or FOS[5]. It acts as the prebiotic for the good growth of the useful Bifidobacteria in the intestine or the gut. It hinders the growth of the disease causing bacteria. Juice of the garlic is beneficial in reduction of the heart related diseases and has also anti-microbial, anti-oxidant and anti-cancer properties. It is also helpful to reduce the effect of the asthma.

Some other daily usage food contents containing the prebiotics have been shown in Table 2[6].

Table 2: daily usage foods bearing the properties of prebiotics

Cheese	Fruit beverages	Fermented milk	Cereals	Salad dressing
Edible coating	custard	Health drinks	Bakery products	Table spreads
Sauces	Infant formula	Weaning foods	Biscuits	Confectionary
Cakes	Desserts	Snack bars	Soups	Yoghurt

CONCLUSION

Prebiotics is an important part of the human nutrition and it should be recommended for the intake in the daily foods of the human. Developing new foods containing the balanced amount of prebiotics would require marketing campaigns and consumers also need time to adapt to the new products[7]. So, developing new products or just reformulating the already available products will help in meeting the requirements of the health-conscious consumers. Prebiotics as required in daily intakes because it help in the reduction or eliminating a number of diseases. Acts as the substrate for the probiotic bacteria such as Bifidobacteria. Prebiotics help in the digestion process, the gastrointestinal problems and also boosts the immune system. Prebiotics helps in the reduction of the blood sugar levels.

REFERENCES

- [1] P. Thammarutwasik *et al.*, "Prebiotics - A Review," *Songklanakarin J. Sci. Technol.*, 2009, doi: 10.9799/ksfan.2017.30.2.191.
- [2] Y. K. Ahmad S, "Health Benefits and Application of Prebiotics in Foods," *J. Food Process. Technol.*, 2015, doi: 10.4172/2157-7110.1000433.
- [3] D. Davani-Davari *et al.*, "Prebiotics: Definition, types, sources, mechanisms, and clinical applications," *Foods*. 2019, doi: 10.3390/foods8030092.
- [4] Y. L. Tsai *et al.*, "Probiotics, prebiotics and amelioration of diseases," *Journal of Biomedical Science*. 2019, doi: 10.1186/s12929-018-0493-6.
- [5] M. Corzo-Martínez, N. Corzo, and M. Villamiel, "Biological properties of onions and garlic," *Trends Food Sci. Technol.*, 2007, doi: 10.1016/j.tifs.2007.07.011.
- [6] T. S. Manning and G. R. Gibson, "Prebiotics," *Best Practice and Research: Clinical Gastroenterology*. 2004, doi: 10.1016/j.bpg.2003.10.008.
- [7] Y. Wang, "Prebiotics: Present and future in food science and technology," *Food Research International*. 2009, doi: 10.1016/j.foodres.2008.09.001.
- Gaurav Verma, Harsh Agarwal, Shreya Singh, Shaheem Nighat Khinam, Prateek Kumar Gupta and Vishal Jain, " Design and Implementation of Router for NOC on FPGA", International Journal of Future Generation Communication and Networking (IJFGCN), Vol. 9, No. 12, December 2016 page no. 263 – 272 having ISSNNo. 2233-7857 .
- Nisha Pandey, B. S. Chowdhary , Bhagwan Das , D. M. Akbar Husain , Vishal Jain , Tanesh Kumar, "Design of Data Processing Device on Low Power SPARTAN6 FPGA", International Journal of Control and Automation (IJCA).
- Sujeet Pandey, Puneet Tomar, Lubna Luxmi Dhirani, D. M. Akbar Hussain, Vishal Jain, Nisha Pandey, "Design of Energy Efficient Sinusoidal PWM Waveform Generator on FPGA",

International Journal of Signal Processing, Image Processing and Pattern Recognition (IJSIP), Vol. 10 No. 10, October, 2017, page no. 49-58 having ISSN No. 2005-4254.

- V.M. Prabhakaran, Prof S.Balamurugan ,A.Brindha ,S.Gayathri ,Dr.GokulKrubaShanker,Duruvakkumar V.S, “NGCC: Certain Investigations on Next Generation 2020 Cloud Computing-Issues, Challenges and Open Problems,” Australian Journal of Basic and Applied Sciences (2015)
- V.M.Prabhakaran, Prof.S.Balamurugan , S.Charanyaa, “Data Flow Modelling for Effective Protection of Electronic Health Records (EHRs) in Cloud”, International Journal of Innovative Research in Computer and Communication Engineering, Vol. 3, Issue 1, January 2015
- R. Santhya, S. Latha, S. Balamurugan and S. Charanyaa, "Further investigations on strategies developed for efficient discovery of matching dependencies" International Journal of Innovative Research in Science, Engineering and Technology Vol. 4, Issue 1, January 2015

