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Oligosaccharides and dietary fiber are not the only prebiotics!
- Exploration for new prebiotic materials -

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Just taking probiotic products is not enough

Many people take live lactic acid bacteria and bifidobacteria every day for the purpose of balancing the intestinal environment. Microorganisms that reach intestines alive and provide beneficial effects to our health are called "probiotics". Various yoghurt manufacturers formulate their own original bacteria in their yoghurt and sell them as "probiotic bacteria *** strain". Recently, researchers have revealed that inactive bacteria also known as "killed bacteria" provide similar effects like probiotics, including an immunostimulatory effect. Therefore, killed bacteria are now blended into various foods and beverages.

There are also many people saying that just taking probiotics is not enough to improve the intestinal environment. There are 100 to 1000 trillion, and over 1000 types of intestinal bacteria in our intestines. Even if we take in just one kind of bacteria to the environments where numerous and abundant kinds of intestinal bacteria reside, the effects may be limited. Research studies have found that people who are suffering from diseases, constipation or fatigue have an imbalance composition of the whole gut microbiota.

Feed intestinal bacteria with prebiotics

Therefore, the idea of “prebiotics” began to gather people’s attention. Prebiotic means “a food ingredient that reaches the large intestine without being digested and absorbed in the human digestive tract, feeds beneficial microorganisms present in the large intestine, and provides beneficial effects on intestinal and overall health” and this idea began to be advocated about 20 years ago. Probiotics are live bacteria while prebiotics are food ingredients that increase good bacteria.

When the idea of prebiotics began to be advocated, people believed that the good bacteria reside in intestines were mainly lactic acid bacteria and bifidobacteria. Therefore, the applicable prebiotics should be oligosaccharides (fructo-oligosaccharides, galacto-oligosaccharides and inulin) that can increase the efficiency of these bacteria. This concept lies in today's prebiotic products that the main ingredients are oligosaccharides.

Research technology has advanced, researchers have revealed that the good bacteria resident in intestines are not only lactic acid bacteria and bifidobacteria. Lately, Faecalibacterium and Roseburia, which can produce short chain fatty acids responsible for the regeneration of colon cells, activation of immune cells, suppression of appetite, prevention of colon cancer, antimicrobial activities, etc. are advocated as good bacteria.
Other various new good bacteria are also found such as Bacteroides fragilis which is involved in immunity, Christensenellaceae which is related to making lean body frame and Equol producing bacteria which makes substances similar to female hormone. These bacteria cannot be taken from the outside the body. Since the food ingredients that can feed each bacteria in the large intestine are different, the concept of prebiotics that was widely believed as taking just oligosaccharides is enough for obtaining a prebiotics effect has shifted to a new concept.
(Nature Rev. 14, 491-502 (2017))

The important thing to improve the intestinal environment is to balance the population of bacteria living there. If we ingest only a specific bacteria or too keen on increasing just a certain bacteria, there is a possibility of disturbing the balance of the entire intestinal environment. Intestinal bacteria cooperate with each other and produce newly different compounds from the substances produced by other bacteria. This is called cross-feeding. Therefore, taking a variety of prebiotic ingredients which are beneficial for intestinal bacteria can improve the balance of the whole intestinal environment.

New prebiotic material to balance bacteria in intestines

Oligosaccharides and dietary fiber are widely known as prebiotics, but the names of resistant starch and resistant protein have also been visible lately as prebiotics.
Furthermore, recent studies have shown that various other compounds exert a prebiotic effect. Here are some examples of the compounds that are drawing people’s attention.

· **Unsaturated fatty acids**

Scientists have examined the intake volume and the level of blood concentration of omega-3 fatty acids among 876 middle-aged and senior women in order to verify the diversity and the range of differences of good intestinal bacteria. As a result, women with a high intake of omega-3 fatty acids showed higher omega-3 concentrations in their blood, and various intestinal bacteria were present in their intestines. In addition, scientists found that there were significantly more kinds of microorganisms belonging to the Lachnospira family. These microorganisms are involved in the prevention of developing infection and obesity as well as being associated with the suppression of intestinal inflammation.
(Sci Rep. 7, 11079 DOI: 10.1038 / s 41598-017-10382-2 (2017))

A study using mice models have reported that the mice given lard which contained a lot of saturated fatty acids increased bad bacteria causing inflammation, while the other mice given fish oils rich in omega-3 fatty acids of unsaturated fatty acids increased Akkermansia genus and lactic acid bacteria that can suppress inflammation and obesity.
(Cell Metabolism. 22, 658-668 (2015))

·**Polyphenol**

Polyphenols are found in vegetables, fruits, spices, cereals, tea, etc. Scientists have revealed that 90 to 95% of them are not absorbed in the small intestine but reach to the large intestine. High-molecular polyphenols such as procyanidins found in apples and grapes, and tannin found in oolong tea and red wine are attracting people's attention as a potential to be prebiotic ingredients. A study using mice unveiled that Akkermansia genus increased when the mice ingested procyanidin derived from apples, and the proportion of Firmicutes/Bacteroidetes, which is an indicator of microbiota involved into obesity, improved as well.
(Sci Rep. 6, 31208 (2016))

Other studies have revealed that polyphenols contained in many foods such as catechin, blueberry extract, pomegranate, almond peel, cocoa, grapes, red wine, etc. can enhance the growth of good bacteria and protect against infections caused by pathogenic bacteria. (Biomed Res Int. DOI: 10.1155 / 2015/850902 (2015))

As you could learn from these studies, many food ingredients are involved in balancing intestinal bacteria. It is nice to add the above mentioned foods to your daily meals, but it is

even more important to eat many different foods even in a small amounts in order to balance the intestinal bacteria. When we serve meals using many different foods, it will naturally contain abundant prebiotics. We should try to avoid eating only particular items and start to eat more variety of food ingredients.