RARE FUNCTIONAL SUGARS

HMOs Shown to Promote Health

Human milk oligosaccharides may have numerous health benefits for infants and adults and have been shown to protect against infections.

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Health has always been at the center of the society, and not just in the current situation. Some functional sugars like human milk oligosaccharides (HMOs) may be able to maintain the health of infants and adults. HMOs are a group of rare functional sugar molecules, which constitute the third most abundant group of solid components of human milk besides fats and lactose. HMOs, estimated as a group of around 200 different types, differ in their structure and perform different roles. Due to their specific characteristics, there are various options for the use of HMOs in baby, adult, and medical nutrition. The most common HMO is 2'-fucosyllactose (2'-FL). This exists in around 80% of all human milk samples. Scientific studies have shown that this functional sugar has some health-promoting effects, which, for example, can support mothers who are unable to breastfeed; as an alternative they can use formula which is enriched with HMOs such as 2'-FL.

Healthy Microbiome

The trisaccharide 2'-fucosyllactose has come to be known for its properties of promoting the development of a natural gut microbiome, having an immunoregulatory effect, and protecting against infections. Jennewein Biotechnologie, a biotechnological company based in Germany, produces 2'-FL among other HMOs on an industrial scale. The company uses a proprietary fermentation process. It is a scalable and cost-efficient process based on the bacteria strain E.coli BL21.The bacteria is genetically modified so that the bacteria produce the enzymes required to form the HMOs. In 2015, 2'-fucosyllactose was approved by the Food and Drug Administration in the USA; In 2017, it received novel food status in Europe. Since then, the company has distributed this HMO to well-known infant food manufacturers in the USA and Europe. 2'-FL is chemically identical to the natural model of breast milk.

Anti-Adhesive Effect

One of the specific benefits of these sugar molecules is an anti-adhesive effect. This means that they may prevent pathogens from entering the body cells of infants and adults. Many HMOs resemble the sugar structures on epithelial cells, which are receptors for pathogens. The result is that pathogens bind to the soluble HMOs and not to their receptors and the pathogen can therefore be excreted from the intestine. Due to this mechanism, HMOs may be able to ward off bacterial and viral infections. As an example, 2'-fucosyllactose and 3-fucosyllactose have been shown in studies to prevent norovirus and rotavirus infections.

New Mix of 5 HMOs

The company now wants to launch a new product generation with its 5-HMO mix to be used as a nutritional supplement in infant food which comes closer to mimicking natural breast milk and contains neutral and acidic HMOs. It consists of five of the most common HMOs in a natural concentration: 2'-fucosyllactose, 3-fucosyllactose, lacto-N-tetraose, 3'-sialyllactose, and 6'-sialyllactose. The mix's composition includes all the health benefits that have been scientifically proven for each of these HMOs. All sugar molecules contained herein have been shown to have an anti-infective effect and to promote a healthy gut microbiome. 3'-sialyllactose and 6'-sialyllactose have also been found to support neuronal development.

Clinical Trial in Italy, Spain, and Germany

To guarantee that this mix is suitable for babies and to comply with the safety standards for approval in the EU, in 2018 Jennewein Biotechnologie launched a clinical study in hospitals in Italy, Spain, and Germany. "It is a 'Growth and Tolerance' study that primarily shows that baby food containing the HMO mix leads to the same good growth of the test subjects as a reference food that does not contain HMOs," explains Dr. Katja Parschat from Jennewein, who managed the study. Within three groups, 324 babies were tested; the first results indicate good tolerance of HMOs. The conclusion of the study and the subsequent product launch in Europe are planned for this year.

Significance of HMOs in the Future

But it is not just this new product that points to a promising future for general health. In the future, all research activities will take place in an R&D center in Bonn where 30 to 40 scientists will work. Here, the objective will be continuing research into metabolic engineering and research work on microbiomes for developing products in the area of "healthy microbiomes." And in the current situation of COVID-19 containment, human milk oligosaccharides could also have a positive role to play. This is due to their anti-adhesive and immunoregulatory effect.▼