

Study Report

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FrieslandCampina's new prebiotic science exploring the gut microbiota effects of Biotis® GOS-OP High Purity.

Small dose, big impact: Explore NEW insights into effective prebiotic dosages

Prebiotics are one of the fastest growing ingredient categories in the gut health market.^{1,2} Known as food (or fuel) for 'good' bacteria in the gut, prebiotics help the gut microbiome to thrive, ultimately supporting overall health and wellness. Among the most trending prebiotics today are galacto-oligosaccharides (GOS). GOS are recognised for their strong bifidogenic effects, i.e., their ability to promote the growth and activity of *Bifidobacterium*—a beneficial bacterium known to support digestive health, improve immune function and even influence mood.^{3,4,5} This makes GOS a possible key player in the gut health space, which is why we're making significant strides to invest in research within this field and expand our portfolio to offer innovative GOS solutions.

One of the latest breakthroughs in our GOS family is [Biotis® GOS-OP High Purity](#)—a high-quality prebiotic that delivers GOS content of over 90%, higher than other prebiotics on the market. With greater GOS concentrations and a proven efficacy at low

¹ Nutraceuticals World. Digesting the gut health market and a bundle of biotics, 2023.

² Market Research Future. Global Gut and Digestive Health Ingredients Market Overview, 2024.

³ Li J, Wang J, Wang M, Zheng L, Cen Q et al. *Bifidobacterium*: a probiotic for the prevention and treatment of depression. *Front Microbiol.*, (2023) 10:1174800.

⁴ Ruiz L, Delagdo S, Ruas-Madiedo P, Sanchez B et al. Bifidobacteria and their molecular communication with the immune system. *Frontiers* (2017) 8.

⁵ Forssten S, Ouwehand A, Griffin S & Patterson E. One giant leap from mouse to man: the microbiota-gut-brain axis in mood disorders and translational challenges moving towards human clinical trials. *Nutrients* (2022) 27:568.

doses, Biotis® GOS-OP High Purity has the potential to transform prebiotic innovation by allowing the development of more convenient and appealing gut-supporting supplements. Proving that less really can be more when it comes to prebiotics. So, what's the latest evidence behind this advanced ingredient?

In a first-of-its-kind study published in [Frontiers of Nutrition](#)⁶, researchers have explored the effects of low dose Biotis® GOS-OP High Purity on *Bifidobacterium* abundance. We caught up with lead author of the paper and Senior Researcher at FrieslandCampina, Ellen Looijesteijn, to dive deeper into this exciting investigation and uncover how it could open up new opportunities in the gut health and women's wellness markets.

GOS prebiotic dosage: key insights at a glance

- *Women aged 40-70 took either 1.3g or 2g of Biotis® GOS-OP High Purity a day for three weeks.*
- *Bifidobacterium in the gut was shown to increase at doses of both of 2g and 1.3g – the industry's lowest tested dose.*

Biotis® GOS-OP High Purity opens up opportunities to develop small, efficacious and science-backed formulations in trending formats like gummies.

1. Why conduct a study focused on optimal prebiotic dosages?

GOS are well-researched prebiotic ingredients, known for their positive effects on the gut microbiota composition and activity, particularly in promoting *Bifidobacterium* growth. However, most studies have focused on high GOS dosages, with limited data on lower doses.^{7,8,9,10,11} This latest groundbreaking clinical trial aimed to address this.

⁶ Looijesteijn E et al., A double-blind intervention trial in healthy women demonstrates the beneficial impact on Bifidobacterium with low dosages of prebiotic galacto-oligosaccharides, *Front Nutr.* (2024) 11.

⁷ Konstanti P, van Splunter M, van den Brink E, Belzer C, Nauta A, van Neerven RJJ, et al. The effect of nutritional intervention with lactoferrin, galactooligosaccharides and vitamin d on the gut microbiota composition of healthy elderly women. *Nutrients.* (2022) 14:2468.

⁸ Jeroense FMD, Michel L, Zeder C, Herter-Aeberli I, Zimmermann MB. Consumption of galacto-oligosaccharides increases iron absorption from ferrous fumarate: a stable iron isotope study in iron-depleted young women. *J Nutr.* (2019) 149:738–46.

⁹ Schaafsma A, Schoemaker M, Bovee I, Hageman J, Janssen C, Nauta A. Effects of galacto-oligosaccharides supplementation on gut comfort and fecal microbiota in female adults with gut complaints. *Curr Dev Nutr.* (2022) 6:1026.

¹⁰ Schoemaker MH, Hageman JHJ, Ten Haaf D, Hartog A, Scholtens PAMJ, Boekhorst J, et al. Prebiotic galacto-oligosaccharides impact stool frequency and fecal microbiota in self-reported constipated adults: a randomized clinical trial. *Nutrients.* (2022) 14:309.

¹¹ Wilms E, An R, Smolinska A, Stevens Y, Weseler AR, Elizalde M, et al. Galactooligosaccharides supplementation in prefrail older and healthy adults increased faecal bifidobacteria, but did not impact immune function and oxidative stress. *Clin Nutr.* (2021) 40:3019–31.

The primary objective of the study was to thoroughly examine the impact of low GOS dosages (1.3 and 2.0 g) on gut health in healthy women, specifically looking at the effect of supplementation on *Bifidobacterium* levels. Our prebiotic, Biotis® GOS-OP High Purity, was the chosen GOS ingredient for the trial. The study was conducted with the hope that demonstrating the effectiveness of GOS at low doses could unlock new possibilities for supplement innovation.

2. What parameters were measured?

In total, 88 women participated in the study. All volunteers were healthy and aged between 42-70 years. The women were divided into different groups depending on their fibre intake, BMI and age to account for any potential influence of these variables on the study outcomes. They were then randomly assigned to two groups: participants consumed either 1.3g or 2.0g Biotis® GOS-OP High Purity daily for three weeks—the industry's lowest tested dose.

Unlike most other prebiotic studies, there was a three-week control period without any intervention *before the supplement period* to allow the researchers to observe natural fluctuations in the gut microbiota over time. By examining microbiota changes from both the control and intervention periods, the study provided more precise insights into the true impact of the prebiotic intervention, separate from natural variations.

Faecal samples were collected at the start and end of the control period to identify *Bifidobacterium* levels, as well as at the end of the intervention period. Additionally, weekly assessments of gut comfort, sleep quality and mental wellbeing were also recorded during the study.

3. Why conduct the study on women only?

The prebiotic-based study targeted women for two main reasons. The first was to compare the results with the outcomes of previous GOS studies that also only focused on women. The second is because supplement use, especially for gut and digestive health, is generally higher in women than in men. Women are therefore a key demographic in this market, making research in this field highly valuable.

4. What important insights did the research reveal about prebiotic dosage?

Results showed that *Bifidobacterium* in the faeces of participants increased significantly after consumption of Biotis® GOS-OP High Purity at both dosages (1.3g and 2g) compared to the control period. The most noticeable effects were observed in the 2g group. With the 2g dose, there was also a broader shift in microbiome composition, suggesting that Biotis® GOS-OP High Purity does not selectively enrich beneficial microorganisms like *Bifidobacterium*, but also influences the gut microbiome more holistically.

5. Why is this significant for supplement brands?

Firstly, this research adds to the growing bank of prebiotic and women's health studies being conducted by FrieslandCampina and the broader health and nutrition industry, thereby contributing to insights in this field. For example, we have also demonstrated

the benefits of 5.5g Biotis™ GOS—our flagship GOS brand—on reducing self-reported anxiety levels in women, while supporting gut health too.¹²

However, what makes this research particularly exciting is that it demonstrates—for the first time—the efficacy of low dosage GOS (previous studies in adults have explored GOS dosages in the range 2.6-15g).^{7,8} Traditionally, efforts to formulate smaller formats such as [gummies](#), tablets and capsules have been limited by the high prebiotic dosage required for effectiveness. But Biotis® GOS-OP High Purity can overcome these barriers with its high concentration and efficacy at just 2g. This offers supplement brands the possibility to develop smaller, more convenient supplement formats that are backed by science. Furthermore, with its lower lactose content—less than 5%— Biotis® GOS-OP High Purity can also help brands meet rising demand for lower-lactose options.

Learn more about the beneficial impact of prebiotic galacto-oligosaccharides by reading the full publication: <https://pubmed.ncbi.nlm.nih.gov/39224188/>

For B2B professionals only

About FrieslandCampina Ingredients

FrieslandCampina Ingredients is a leader in proteins and prebiotics, addressing the growing need for innovative nutritional solutions to the world's health and well-being challenges. Its drive is to get the right ingredients to customers to help them create highly nutritious, sustainable applications to help people with special dietary needs and preferences get the most out of life, always.

Powered by 1,700 passionate specialists, FrieslandCampina Ingredients operates globally across the Early Life Nutrition, Active, Performance, Medical and Cell Nutrition market segments. The company has regional sales offices in the Netherlands, the United States, Singapore, China and Brazil. It reported combined sales of €1.65 billion in 2022. For additional information, please visit: www.frieslandcampinaingredients.com.

FrieslandCampina Ingredients is part of Royal FrieslandCampina N.V. The dairy company daily provides millions of consumers throughout the world with dairy products containing valuable nutrients from milk. The company is fully owned by Zuivelcoöperatie FrieslandCampina U.A., with 15,137 dairy farmers in the Netherlands, Belgium and Germany as members. Its annual turnover amounted to €14.1 billion in 2022. FrieslandCampina has locations in 31 countries and exports to more than one hundred countries worldwide. In 2022, FrieslandCampina employed an average of 21,715 employees (FTEs). Its head office is located in the Netherlands.

¹² Johnstone N et al, 2019