# Beneficial Effects of Human Milk ()ligosaccharides and Lactose ON THE MICROBIOME OF INFANTS WITH COW'S MILK ALLERGY

#### THE IMPORTANCE OF NUTRITION AND THE MICROBIOME IN EARLY LIFE

Early life nutrition is vital for establishing a healthy foundation for infants. Breast milk contains several important components, such as human milk oligosaccharides (HMO) and lactose, which are essential for immune and microbiome development.<sup>1,2</sup>

These immunomodulatory components are particularly beneficial for infants with cow's milk allergy (CMA). These infants are likely to experience intestinal microbial dysbiosis, characterized by low Bifidobacteria levels, thought to delay immune maturation and increase the risk of infections.<sup>3-6</sup>

**HMO** 

Lactose



#### **RECENT CLINICAL FINDINGS IN CMA INFANTS**

- Two HMO (2'-FL and LNnT) enrich all 4 infant-type Bifidobacterial strains and their associated immunemodulating metabolites (e.g., short-chain fatty acids (SCFA), aromatic lactic acids).<sup>3,4</sup>
- Lactose has been shown to enrich fecal Bifidobacteria and increase the production of SCFA in the colon.<sup>2</sup>



# WHAT IS NEW?

For the first time, the additive benefits of combining these 2 significant HMO found in breastmilk (2'-FL and LNnT) with lactose were observed in an *ex-vivo* fermentation study using stool samples from infants with suspected CMA. The study demonstrated increased levels of beneficial infant-type Bifidobacteria and health-related metabolites.<sup>6</sup>

# DEMONSTRATED EFFECT OF HMO AND LACTOSE ON INFANT-TYPE BIFIDOBACTERIA

HMO (2'-FL and LNnT) and lactose independently and significantly increased three infant-type Bifidobacterium species (*B. breve, B. longum*, and *B. pseudocatenulatum*). The combination of HMO (2'-FL and LNnT) and lactose also significantly increased *B. bifidum*, and significantly decreased *C. difficile*.<sup>6</sup>

#### IMPACT AND ASSOCIATED BENEFITS OF HMO AND LACTOSE ON METABOLIC PRODUCTS OF INFANT TYPE BIFIDOBACTERIA

The increase in infant-type Bifidobacteria was correlated with increased health-related metabolites, including SCFA, aromatic lactic acids (indole-3-lactic acid), and N-acetylated amino acids (NAA), with the greatest effect observed from the combination of lactose and HMO (2'-FL and LNnT).<sup>6</sup>





The combination of two HMO (2'-FL and LNnT) and lactose has the largest impact on increasing infant-type Bifidobacteria levels and metabolite production.<sup>6</sup>



### CONCLUSION

Addressing microbial dysbiosis through nutrition is crucial for infants with CMA. *Ex-vivo*, the combination of HMO (2'-FL and LNnT) and lactose has shown an additive effect in supporting immune and microbiome development.

IMPORTANT NOTICE: Mothers should be encouraged to continue breastfeeding even when their infants have cow's milk protein allergy. This usually requires qualified dietary counseling to completely exclude all sources of cow's milk protein from the mothers' diet. If a decision to use a special formula intended for infants is taken, it is important to give instructions on correct preparation methods, emphasizing that unboiled water, unsterilized bottles or incorrect dilution can all lead to illness. Formula for special medical purposes intended for infants must be used under medical supervision.

**1.** Lordan C et al. Microbiol Mol Biol Rev. 2024;88(1):e0009423. **2.** Francavilla R et al. Pediatr Allergy Immunol. 2012;23(5):420-427. **3.** Boulangé CL et al. International Journal of Molecular Sciences. 2023;24(14):11422. **4.** Gold MS et al. Nutrients. 2022;14:2297. **5.** Vandenplas Y et al. Nutrients. 2022;14:530. **6.** Van den Abbeele, P., Heine, R.G., Van de Vliet, M., Favre, L., Tytgat, H.L.P., Sprenger, N., Deyaert, S., Baudot, A., & Nutten, S. (2024). Impact of two human milk oligosaccharides and lactose on the faecal microbiome of infants with probable cow's milk allergy. Beneficial Microbes (published online ahead of print 2024). https://doi.org/10.1163/18762891-bja00048

