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Remarkable properties of human milk oligosaccharides: What can we learn from Mother Nature?

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Human milk is a highly complex liquid containing thousands of biomolecules. It serves as the sole nutrition for the fast growing and vulnerable infant and has evolved under a trade-off optimization process between mother and child. The success of this evolutionary process is demonstrated by many studies that show that breast-fed infants have a range of health benefits compared to formula-fed infants. Several of these benefits are assumed to be mediated through the effects of the breastmilk glycans on the commensal gut microbial flora of a healthy infant. The free human milk oligosaccharide (HMO) fraction is the third largest component of human milk (after lactose and lipids) and is highly complex in its composition. To date, infant formula is not supplemented with glycans that are identical to the naturally occurring HMOs and much work has taken place to develop functional mimics. However, regrettably many efforts have been primarily cost-driven and ignored much of the valuable lessons that evolutionary biology should teach us if we consider details of glycan structure-activity-relationship and consider species-specific differences in milk oligosaccharide composition. Glycom is committed to make human-identical milk oligosaccharides available for food applications, particularly infant formula. The technological challenges to achieve this are huge and dictate a step-wise approach, where the most significant individual components are developed and added to infant formula first. To date, this has been successfully achieved for two important HMOs where robust production technologies have been developed and first clinical results have become available.

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