



HUMAN MILK OLIGOSACCHARIDES (HMOs)

EMERGING SCIENCE
ON POTENTIAL
COMPLEMENTARY BENEFITS

HMOs ARE:



Unique prebiotics found naturally in human milk^{1,2}



Food for beneficial bacteria in the infant's gut^{1,2*}



Non digestible and arrive at the lower GI tract intact^{1,2*}

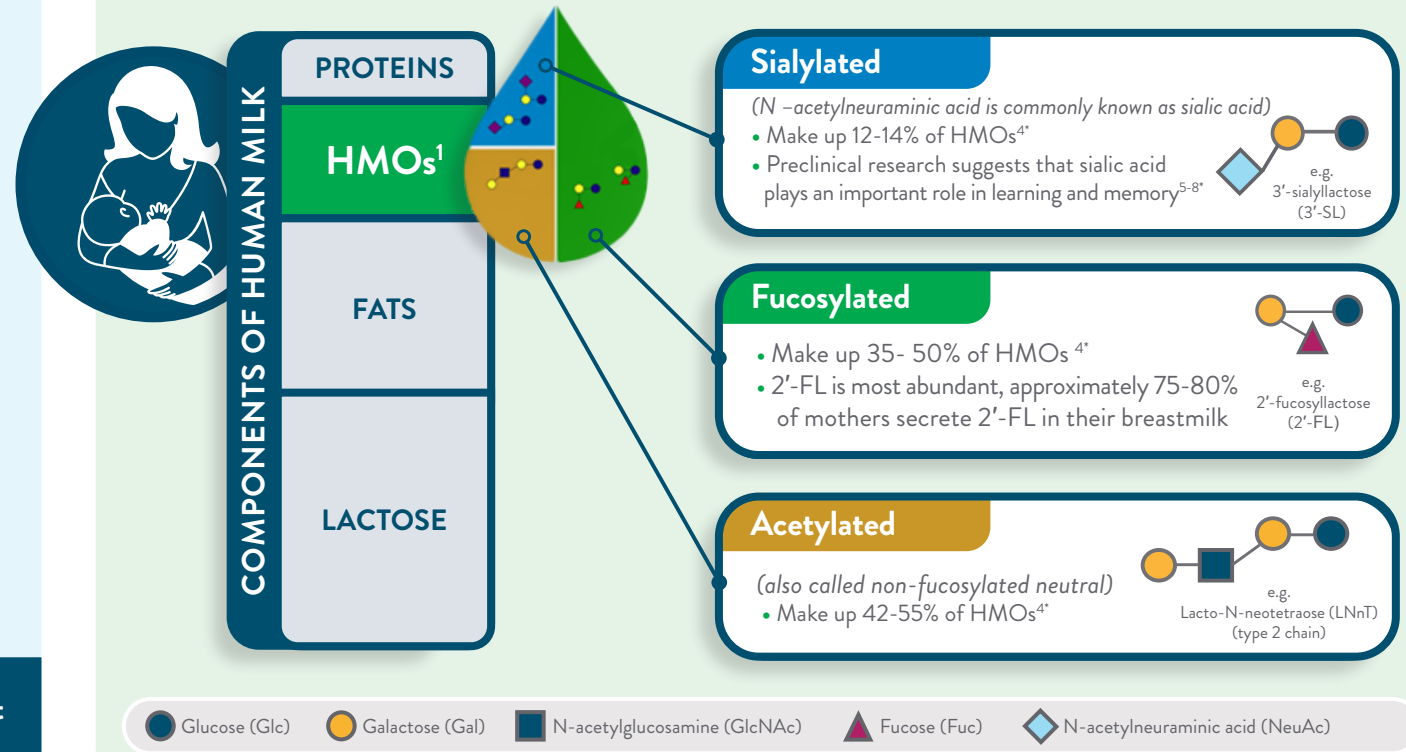


In cell culture, a potential receptor decoy that may help reduce pathogen adhesion^{1,2*}

HMOs are the third most abundant solid component of human milk^{1,2}

There are more than 150 HMOs across 3 categories^{1*}

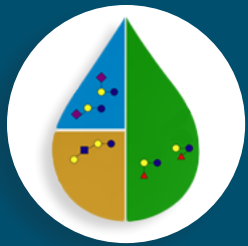
- Amounts and types of HMOs vary from mother to mother, most likely as a result of genetics
- Overall HMO concentration is highest in colostrum and decreases across lactation³
- Emerging research suggests that different HMOs may support brain development, digestive health, and immune system functions^{1*}



*Preclinical research

WHY ARE HMOs IMPORTANT?

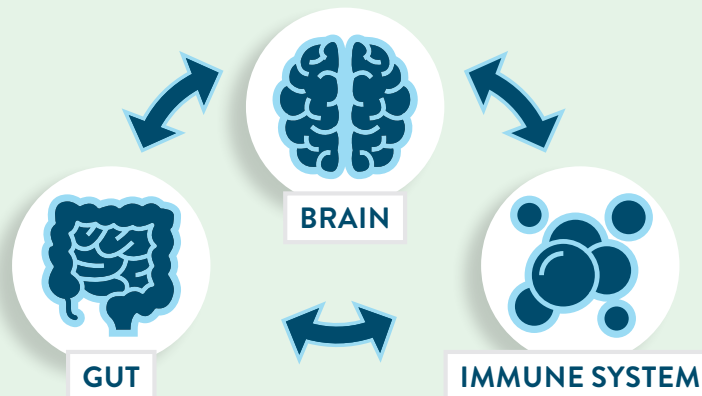
The infant's immune system is immature at birth. Supporting development of a healthy immune system is critical in the first year of life.



Preclinical research suggests that providing different HMOs across all 3 categories may work in complementary ways to provide whole body benefits.¹

Emerging science suggests that HMOs May Support Gut, Brain & Immune Functions

70% of the immune system is in the gut and there are millions of neurons which communicate with the brain via the vagus nerve^{9,10*}



Brain Development

- 2'-FL and 6'-SL HMOs are associated with improved motor scores and cognitive development in breastfed infants^{11,12}
- Sialylated HMOs have sialic acid, a nutrient suggested to be important for brain development^{13*}
- Some HMOs may play a beneficial role in the brain through communication via circulation and the vagus nerve^{14*}

Immune Support

- 2'-FL HMO reaches circulation beyond the gut and helps reduce multiple inflammatory cytokines¹⁵
- In mice, 2'-FL and 6'-SL HMOs have been shown to reduce symptoms of food allergy such as diarrhea severity and hypothermia^{16*}

Gut Health

- May support growth of beneficial bacteria in the gut¹
- In cell culture, may reduce pathogen adherence to gut cells by acting as receptor decoys^{1*}
- In breastfed infants, 2'-FL HMO has been associated with reduced infectious diarrhea¹⁷

*Preclinical research



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1. Hill DR, et al. *Nutrients*. 2021;13(10):3364. | 2. Bode L. *Glycobiology*. 2012;22(9):1147-1162. | 3. Walsh C, et al. *J Funct Foods*. 2020;72:104074. | 4. Plaza-Diaz J, et al. *Nutrients*. 2018;10(8):1038. | 5. Hobbs M, et al. *Foods*. 2021;10(2):473. | 6. Lis-Kuberka J, Orczyk-Pawilowicz M. *Nutrients*. 2019;11(2):306. | 7. ten Bruggencate SJ, et al. *Nutr Rev*. 2014;72(6):377-89. | 8. Hauser J, et al. *Mol Psychiatry*. 2021;26:2854-2871. | 9. Perdigón G, Fuller R, Raya R. *Curr Iss Intest Microbiol*. 2001;2(1):27-42. | 10. Jacobson A, et al. *Mucosal Immunol*. 2021;14(3):555-565. | 11. Oliveros E, et al. *J Nutr Food Sci*. 2021;4:100024. | 12. Berger PK, et al. *PLoS one*. 2020;15(2):e0228323. | 13. Wang B. *Annu Rev Nutr*. 2009;29:177-222. | 14. Al-Khafaji AH, et al. *J Funct Foods*. 2020;74:104176. | 15. Goehring KC, et al. *J Nutr*. 2016;146(12):2559-2566. | 16. Castillo-Courtade L, et al. *Allergy*. 2015;70(9):1091-1102. | 17. Morrow AL, et al. *J Pediatr*. 2004;145(3):297-303.