HUMAN MILK OLIGOSACCHARIDES (HMOs)

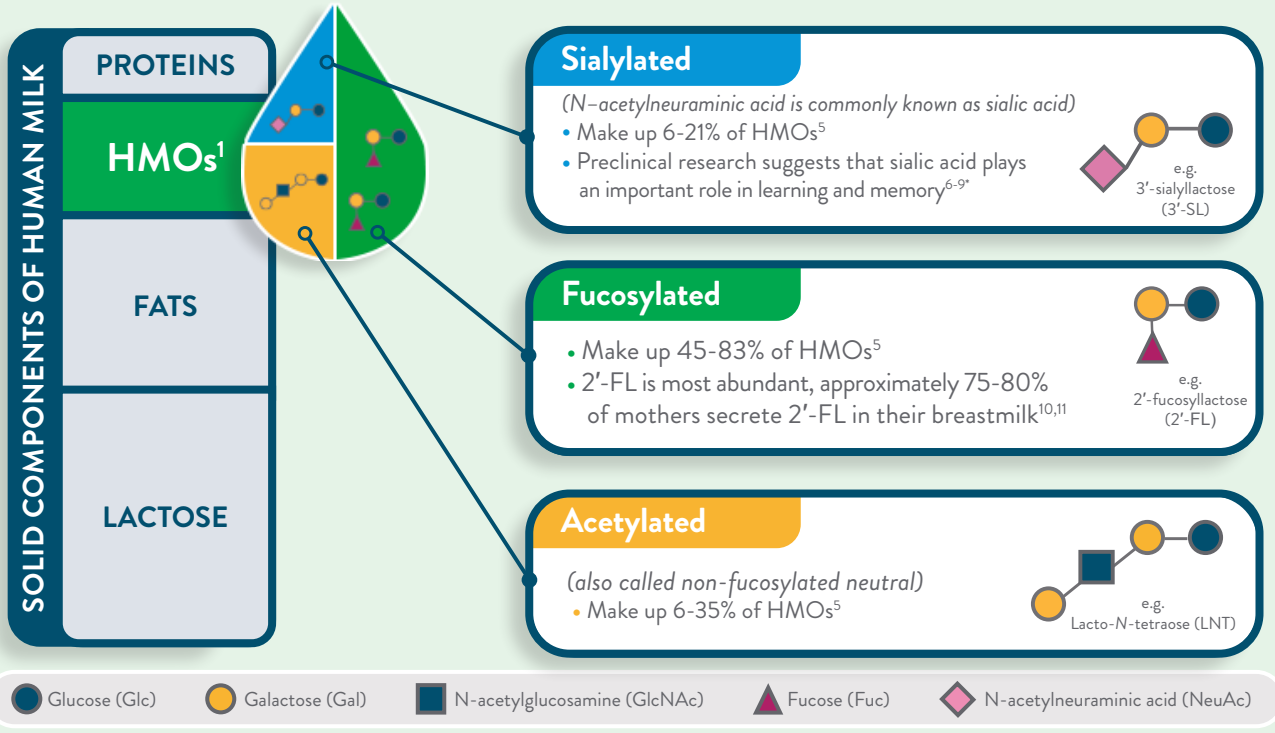
EMERGING SCIENCE ON POTENTIAL COMPLEMENTARY BENEFITS

HMOs are:

- The third most abundant solid component of human milk[1,2]
- Unique prebiotics found in human milk[1,2]
- Non digestible and arrive at the lower GI track intact where they are food for beneficial gut bacteria[1,2]
- In cell culture, certain HMOs act as receptor decoys to block specific pathogen attachment to epithelial cells[1*]

There are more than 150 HMOs[1*]

- Individual HMOs belong to one of three categories: Acetylated**, Fucosylated, and Sialylated
- Amounts and types of HMOs vary from mother to mother, most likely as a result of genetics[3]
- Overall HMO concentration is highest in colostrum and decreases across lactation[4]
- Each HMO category has a different structure, and emerging research suggests that these structures support unique functions and benefits for brain development, and for the immune and digestive systems[1*]



*Preclinical research ** nonfucosylated; containing N-acetylglucosamine

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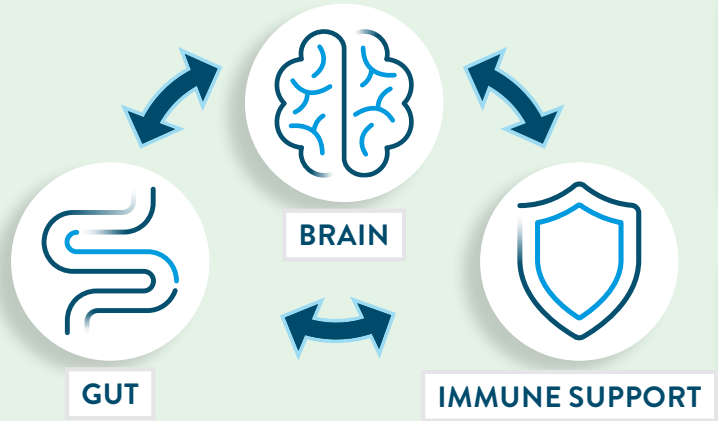
WHY ARE HMOs IMPORTANT?

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 shows that the unique structures and functions of each HMO category work in different, but complementary, ways to provide for multi-system support.[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[12,13*]



Brain Development

- Human milk concentrations of 2′-FL and 6′-SL HMOs have been associated with measures of improved cognitive development [outcomes] through 24 months of age[14,15]
- Sialylated HMOs have sialic acid, a monosaccharide, suggested to be important for brain development[16,17*]
- Preclinical research suggests that HMOs play a beneficial role in the brain through communication via circulation and the vagus nerve[18*]

Immune Support

- HMOs specifically interact with immune cells and facilitate a balance of pro/anti-inflammatory cytokines[19*]
- 2′-FL HMO was shown in a clinical study** to lower levels of multiple inflammatory cytokines to be more like levels in breastfed infants[20]

**Shown in healthy term infants consuming standard infant formula

Gut Health

- May support growth of beneficial bacteria in the gut[1, 21, 22]
- In over 15 studies in cell culture, HMOs act as receptor decoys to block pathogen adhesion[1*]
- In breastfed infants, higher levels of 2′-FL HMO in breastmilk is associated with lower incidences of bacterial diarrhea[23]

*Preclinical research

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