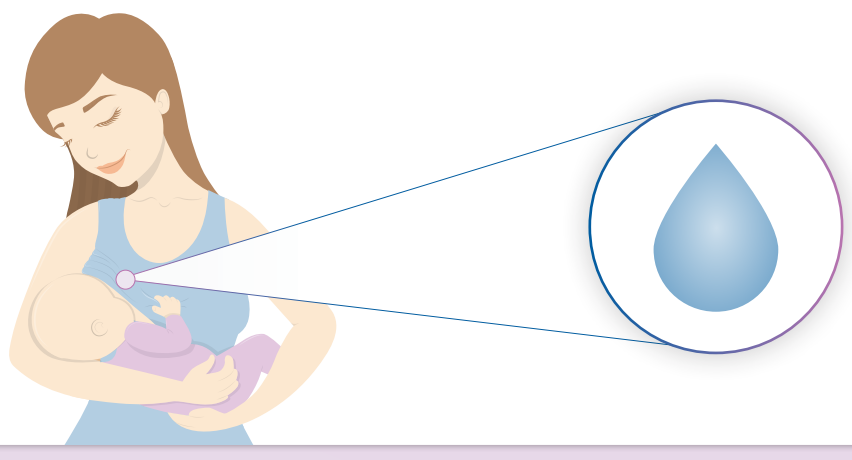
The diversity of HMOs impacts their functions

Wyeth Nutrition SCIENCE CENTER

HMOs are known as one of the most important bioactive components in breastmilk[1]

Unique, complex carbohydrates (oligosaccharides) naturally found in human milk[2]



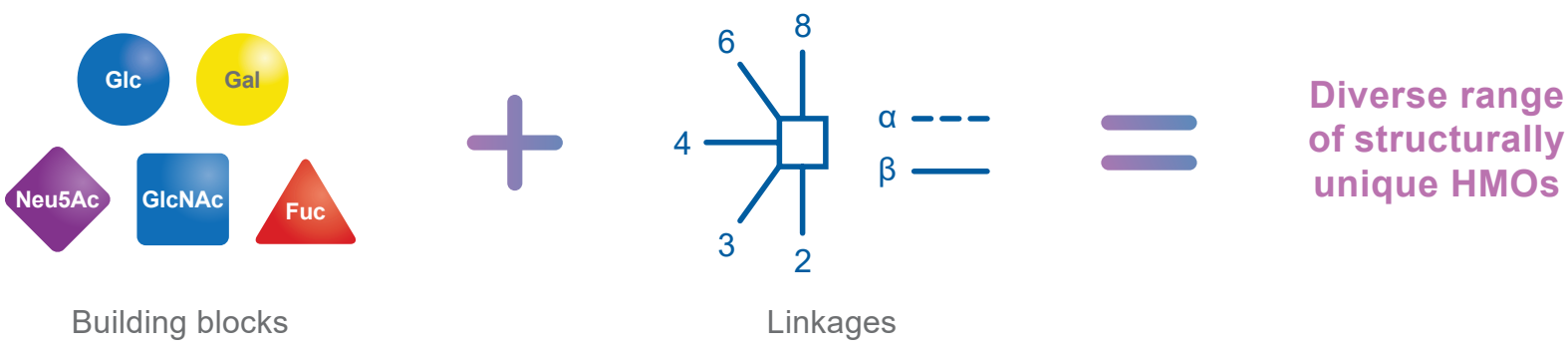
3rd largest solid component of human milk[3-5]:

20–25 g/L in colostrum

5–15 g/L in mature milk

HMOs are remarkably diverse,[6-8] which arises from the variety of their structural features[7-9]

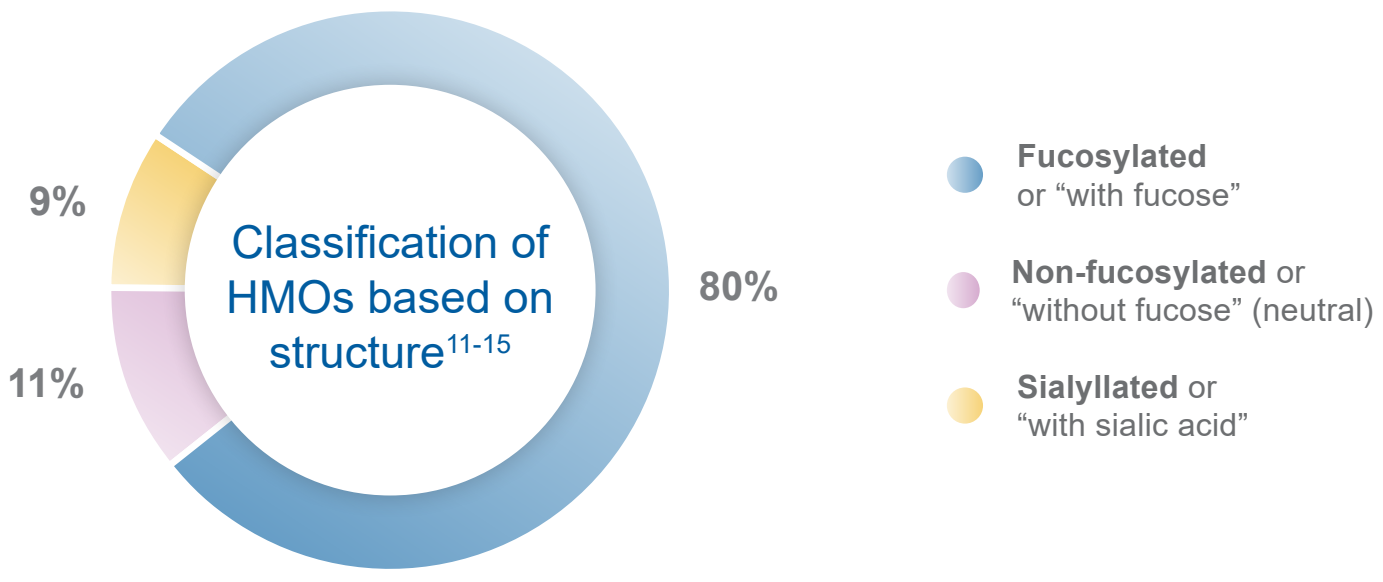
Composed of a vast combination of building blocks and linkages[8]



Building blocks

Linkages

Over 160 structurally unique HMOs have been identified[10]



The different structural features of HMOs are thought to contribute to their **many functions**[1,6-9,16-23]

Emerging data on the function of different HMOs suggest benefits related to[1,4,11-20]:

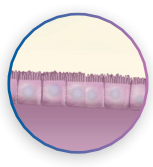
Gut and immune health

Brain and cognitive development

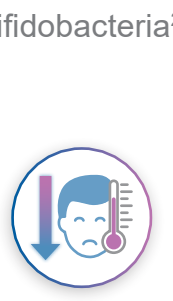
Research shows HMOs support **gut and immune health** on many levels

Promote the abundance of bifidobacteria[21-29]

Inhibit and deflect fecal pathogens[24,26,27,29]



Strengthen gut barrier function[30,31]



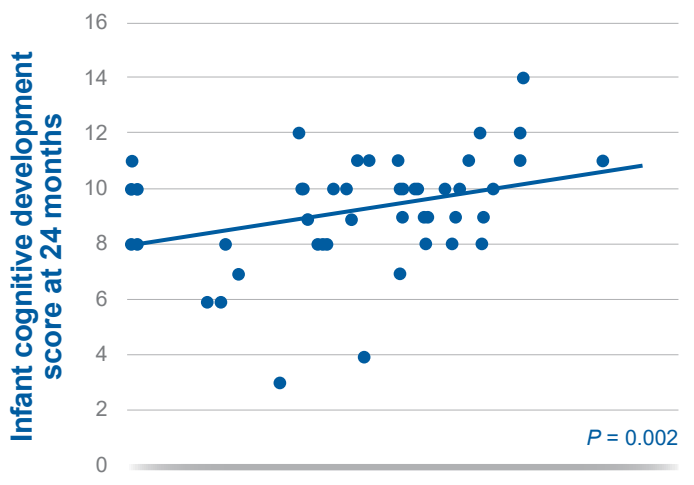
Associated with less illness[19,20,32]

Encourage healthy immune response in the gut and systemically[24,26,30,32-37]

Emerging research suggests HMOs support **brain and cognitive development**

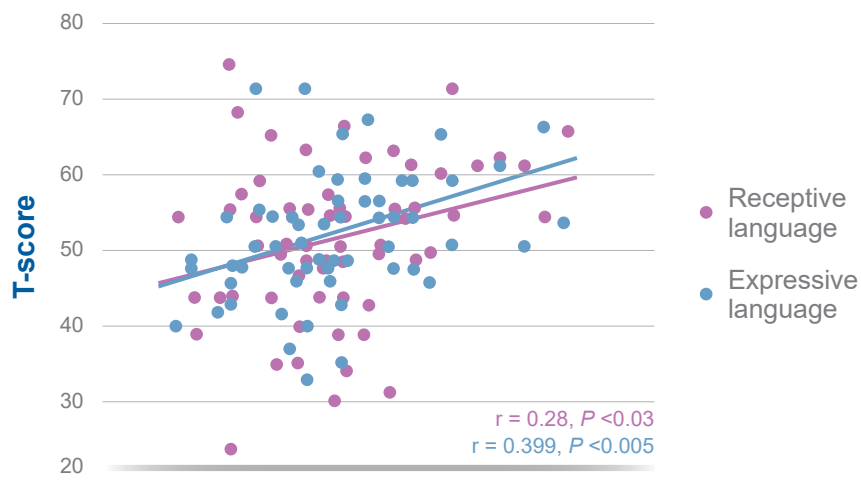
Observational studies show associations between HMO composition of human milk and cognitive development in breastfed infants[38,39]

Higher exposure to 2'FL at 1 month results in a higher cognitive development score at 24 months of age[38,*]



*While the assessment was done at both 1 and 6 months, the link was only observed at 1 month, but not at 6 months.

Levels of 3'SL are positively associated with receptive and expressive language scores[39,†]



†This association between human milk 3'SL and language was observed in the subset of infants whose mothers' milk contained detectable A-Tetra HMO.

Preclinical data provide insight into the functional role of HMOs in brain and cognitive functions

3'SL and 6'SL improve executive functions and learning[40-42]

3'SL and 6'SL enrich ganglioside sialic acid (important for brain development[4,43]) in the brain and modulate the gut microbiota[44]

2'FL increases long-term potentiation and learning[45,46]

Abbreviations: HMO = Human milk oligosaccharide; Glc = Glucose; Gal = Galactose; Neu5Ac = Sialic acid (*N*-acetyl-neuraminic acid); GlcNAc = *N*-acetyl-glucosamine; Fuc = Fucose; 2'FL = 2'-fucosyllactose; 3'SL = 3'-sialyllactose; 6'SL = 6'-sialyllactose.

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