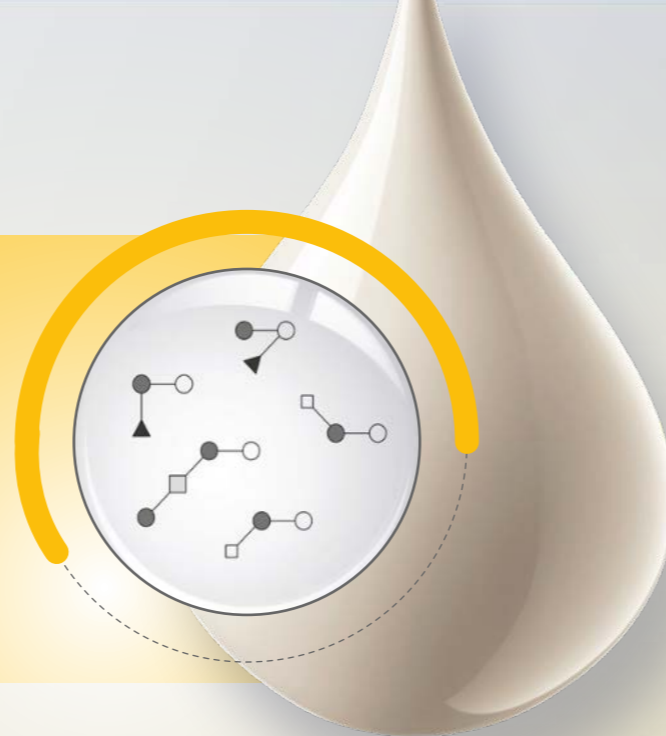


LACTOSE & HUMAN MILK OLIGOSACCHARIDES



Carbohydrates represent the largest group of macronutrients in breastmilk, and include lactose and Human Milk Oligosaccharides (HMOs).¹³

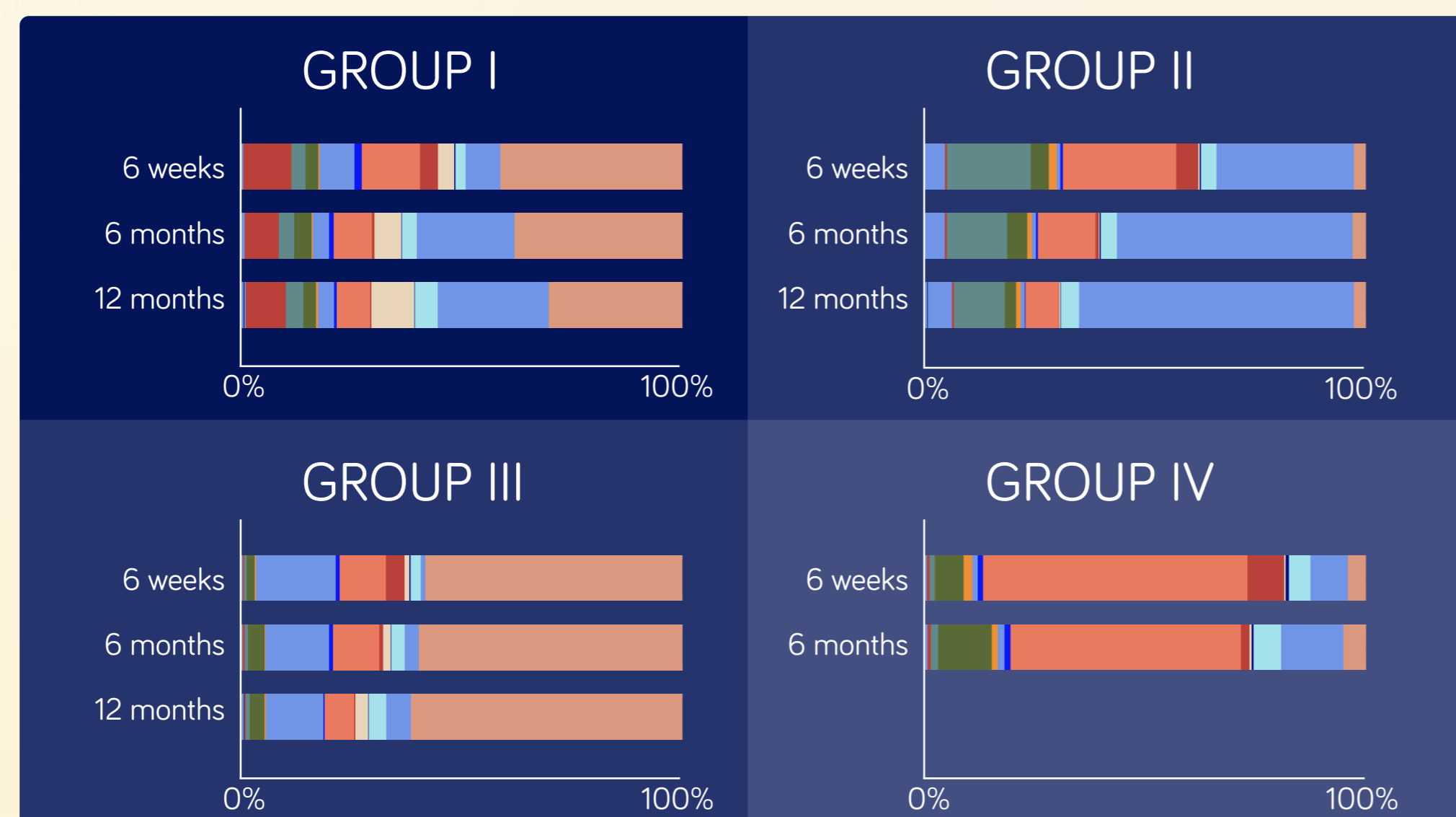
Lactose serves as an energy source, human milk lactose provides around 40% of total energy for the infant.¹⁴

Human milk oligosaccharides (HMOs) represent the 3rd most abundant fraction of biomolecules found in human milk.^{15,17}

- ✓ HMOs may support healthy development of the infant by many beneficial effects (prebiotic, anti-infective, and immunomodulatory as well as impact on developing gut (microbiome) etc.).^{16,17}
- ✓ HMO concentrations are highly variable between mothers and change over the course of lactation.¹⁸
- ✓ Maternal genetics (expression of Secretor and Lewis genes) leads to different HMO profiles in human milk. These specific HMO profiles allow assignment of individual milks to one of 4 different human milk groups.^{19,20}

HMO-VARIATIONS IN MILK GROUPS FROM 6 WEEKS TO 12 MONTHS POST PARTUM

The overall distribution of human milk groups was similar as described in literature. 74% was attributed to human milk group I, 18% to human milk group II, 7% to human milk group III, and 1% to human milk group IV. In addition, we were able to distinguish the trajectories of individual HMOs, from 6 weeks post-partum to 12 months post-partum, in the different human milk groups as depicted below.



Key



NEW INSIGHTS INTO LACTOSE & HMOS



Lactose concentrations increased at 6 months and decreased significantly at 12 months compared to 6 weeks of lactation.

Total HMO concentrations decreased significantly at 6 months ($\beta = -1.3487$, $p < 0.0001$) and 12 months ($\beta = -1.0606$, $p < 0.0001$) compared to 6 weeks of lactation, regardless of secretor status or human milk group.

Although the overall content of HMOs decreased (even after correction for early life factors like pre-pregnancy BMI, parity, gestation period, delivery mode, exclusive breastfeeding, and gender of the infant) concentrations of some structures increased (i.e. 3'-SL, 3-FL, DFL).

Some individual HMO isomers (3'-SL & 6'-SL as well as 2'-FL & 3-FL) showed opposite trajectories over the course of lactation: 3'-SL and 3-FL increased, whereas 6'-SL and 2'-FL decreased.

Total combined HMOs (sum of 14 detected structures; mean values) were significantly lower in human milk group IV (3.02 g/L) compared to group I (5.76 g/L), group II (4.30 g/L), and group III (6.44 g/L).

Individual HMOs independent from maternal Secretor and Lewis genotype varied between milk groups such as 3-FL (highest in group II) and LNT (highest in group IV). Most of the other HMOs also differed significantly by secretor status, except 6'-GL, 6'-SL, and LNFP III.