

2'-Fucosyllactose: The Most Abundant HMO



HMOs: A structurally diverse complex mixture

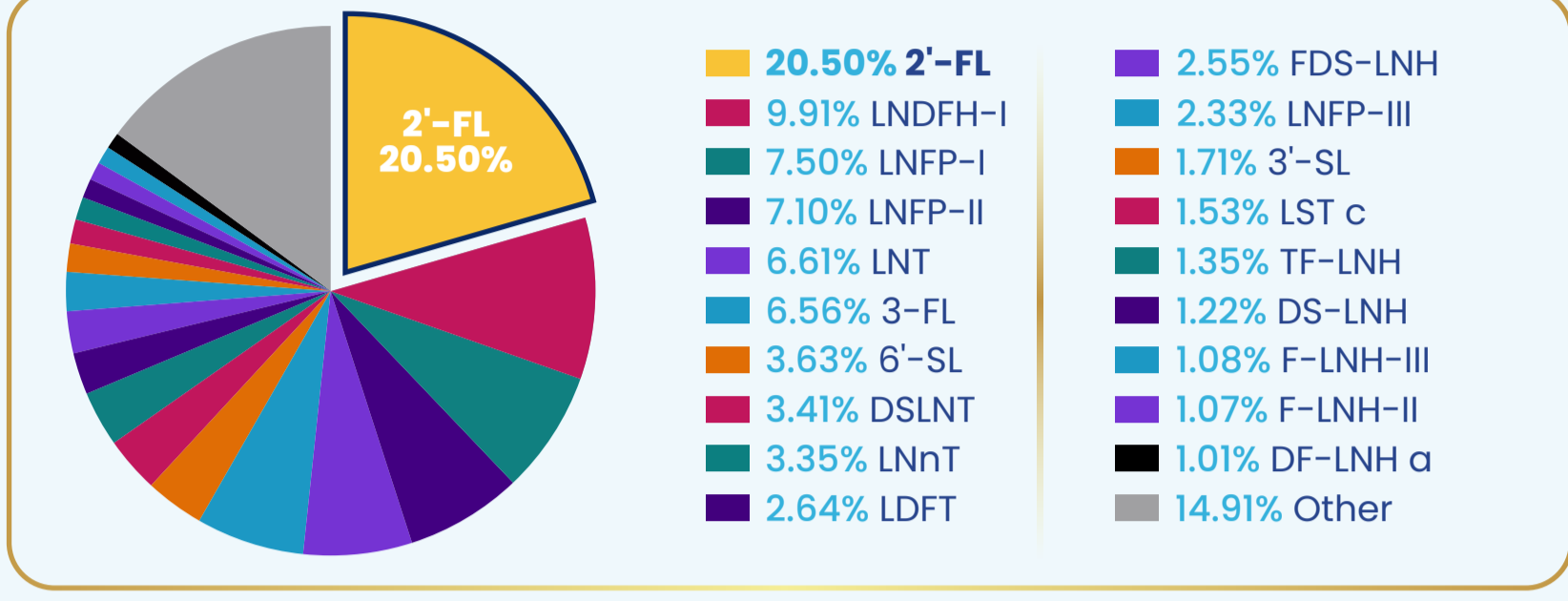
HMOs are important bioactive molecules present in breastmilk.¹

All HMOs are lactose-based.

~162 oligosaccharide structures have been identified so far.²

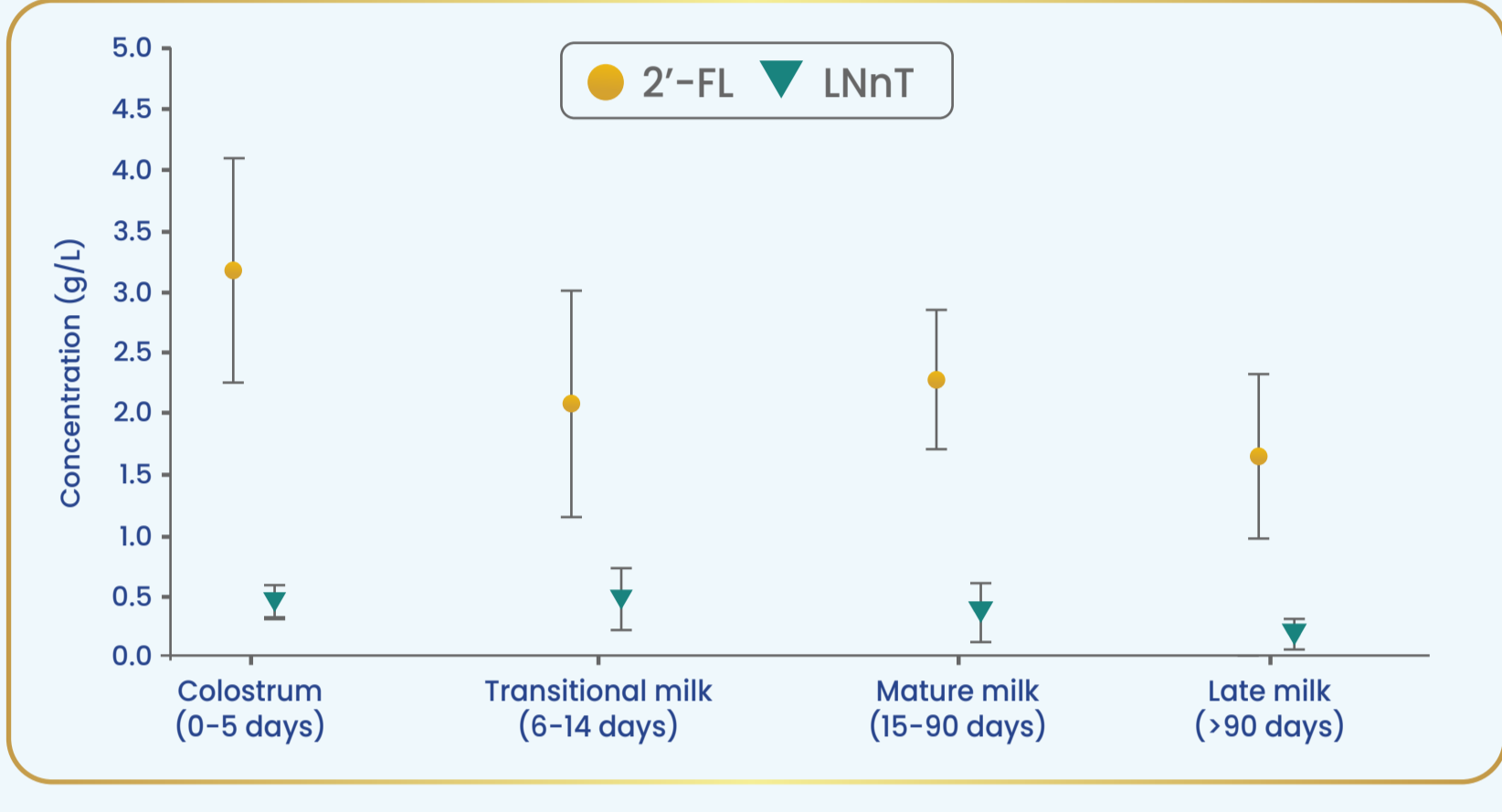
HMO distribution in breastmilk

2'-FL is the most abundant HMO (nearly 30% of total HMOs in secretor mothers).⁴



HMOs concentration in breastmilk very dynamic and it varies throughout the lactation period.⁵

Concentration of HMOs is 20 g/L in colostrum which reduces to 12-15 g/L in mature milk.^{2, 5-6}



Benefits of 2'-FL

2'-FL provides several health benefits leading to improved overall gut health and immunity in infants.⁴

Safety & clinical outcomes

- No reports of adverse events
- Supports normal growth and defecation

Modulation of gut microbiota

- Can support healthy gut microbiota establishment in infants

Immune modulation

- Attenuates immune cell responses
- Exhibits lower plasma inflammatory cytokine profiles

Anti-adhesive properties

- Inhibits *Campylobacter jejuni* infection and inflammation
- Beneficial against necrotizing enterocolitis

Brain development

- Can stimulate brain development and cognitive domains

Scientific evidence of HMOs in infant nutrition

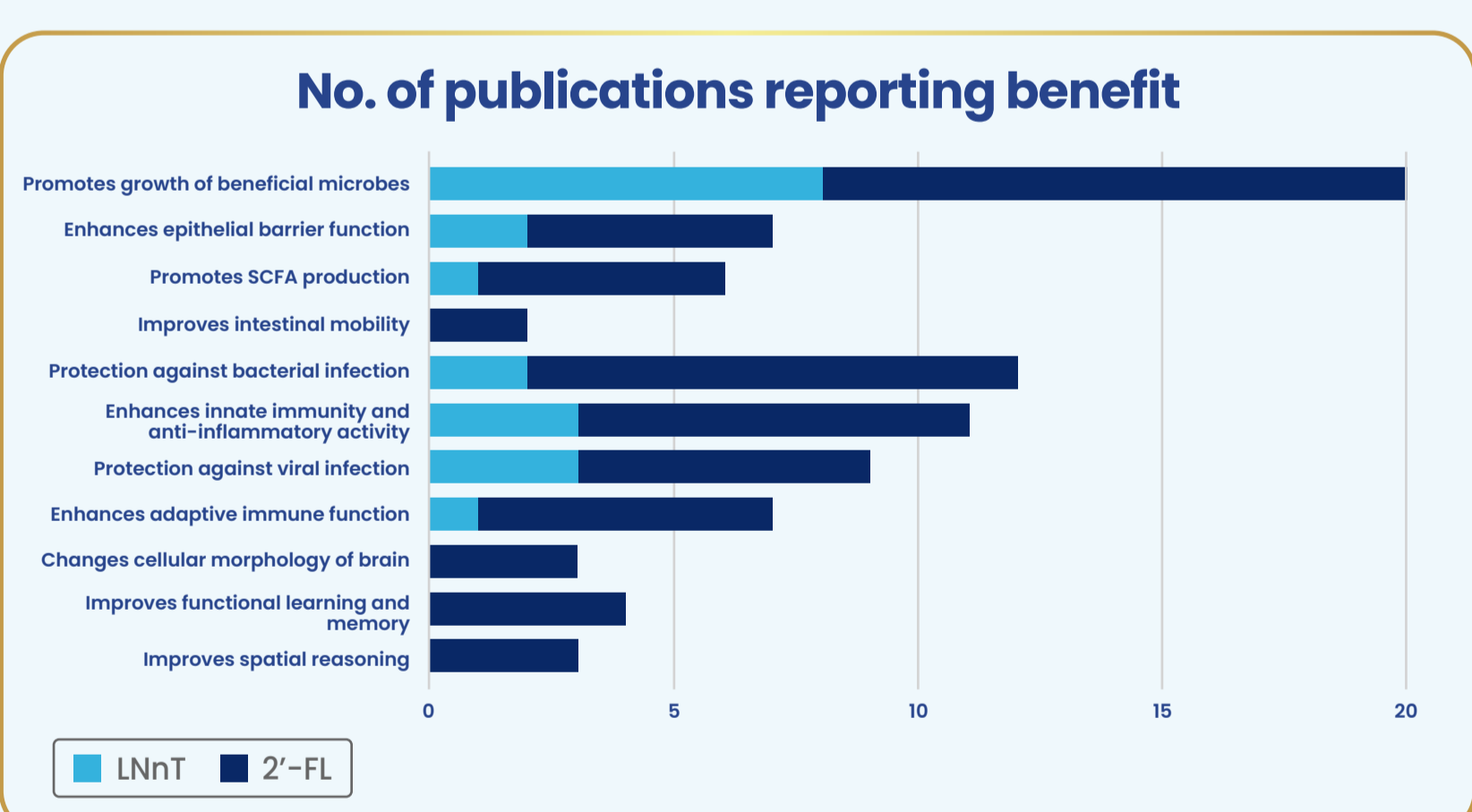
Studies on HMOs are mainly focused on:⁸

Digestive health

Immune support

Cognition

No. of research publications on 2'-FL are significantly higher.⁸



Regulatory status of Addition of HMOs in infant feeds^{2,9-11}

HMO like 2'-FL has been approved for addition in infant and follow-on feeds as a 'novel ingredient' due to their structural similarity to HMOs found in breast milk.

Addition of 2'-FL is determined as **Generally Regarded as Safe (GRAS)** at a level up to **2g/L**, and the addition to infant feed is approved by EFSA, EU and US FDA.

As 2'-FL is the highest contributor of HMO among all HMOs, the safety and clinical benefit of addition of 2'-FL has been successfully studied at a maximum level of **1.2 g/L** in infant feeds.

Key takeaways

- Breastmilk contains diverse types of HMOs; **2'-FL is the most abundant HMO.**
- Several infant and maternal factors may influence the diversity and levels of HMOs, including **lactation stage.**
- 2'-FL offers a plethora of health benefits for infants, such as **gut health, immune health, and cognitive development.**
- Feeds containing 2'-FL are proven to be **safe and well-tolerated** in infants.

References

- Wiciński M, et al. *Nutrients*. 2020;12(1):266.
- Vandenplas, Y et al. *Nutrients*. 2018;10(9):1361.
- Ayechu-Muruzabal V et al. *Front Pediatr*. 2018;6.
- Hegar B, et al. *Pediatr Gastroenterol Hepatol Nutr*. 2019;22(4):330.
- Soyilmaz B, et al. *Nutrients*. 2021 Aug 13;13(8):2737.
- Saiminen S, et al. *Nutrients*. 2020;12(7):1952.
- Thum C, et al. *Nutrients*. 2021;13(7):2272.
- Hill DR, et al. *Nutrients*. 2021;13(10):3364.
- Puccio G, et al. *J Pediatr Gastroenterol Nutr*. 2017;64(4):624-31.
- Román E, et al. *Nutr Hosp*. 2020;37(4).
- Management Board members, Executive Director, Operational Management.
- Safety of 2'-O-fucosyllactose as a novel food ingredient pursuant to Regulation (EC) No 258/97. European Food Safety Authority. 2015.

Abbreviations
 2'-FL: 2'-Fucosyllactose; 3-FL: 3-Fucosyllactose; 3'-SL: 3'-Sialyllactose; 6'-SL: 6'-Sialyllactose; BMI: Body mass index; DF-LNH α: Difucosyllacto-N-hexose α; DS-LNH: Disialyllacto-N-hexose; DSLNT: Disialyllacto-N-tetraose; EFSA: European Food Safety Authority; EU: European Union; FDS-LNH: Fucosylidisialyllacto-N-hexose; F-LNH: Fucosyllacto-N-hexose; HMOs: Human milk oligosaccharides; LDFT: Difucosyllactose; LNDFH-I: Lacto-N-difucohexose I; LNFP: Lacto-N-fucopentaose; LNnT: Lacto-N-neotetraose; LNT: Lacto-N-tetraose; LST c: Sialyllacto-N-neotetraose c; TF-LNH: Trifucosyllacto-N-hexose; SCFA: Short-chain fatty acid; US FDA: The United States Food and Drug Administration

IMPORTANT NOTICE: MOTHER'S MILK IS BEST FOR YOUR BABY
 The World Health Organization (WHO)¹ has recommended that pregnant women and new mothers be informed of the benefits and superiority of breastfeeding, in particular, the fact that it provides the best nutrition and protection from illness for babies. Mothers should be given guidance on the preparation for and maintenance of lactation, with special emphasis on the importance of the well-balanced diet both during pregnancy and after delivery. Unnecessary introduction of partial bottle feeding or other foods and drinks should be discouraged since it will have a negative effect on breast-feeding. Similarly, mothers should be warned of the duty of reversing a decision not to breastfeed. Before advising a mother to use an infant formula, she should be advised of the social and financial implications of her decision. For example, if a baby is exclusively bottle-fed, more than one can (500g) per week will be needed, so the family circumstances and cost should be kept in mind. Mother should be reminded that breast milk is not only the best but also the most economical food for babies. If a decision to use infant formula is taken, it is important to give instruction on correct preparation methods, emphasizing that unboiled water, unsterilized bottles or incorrect dilution can lead to illness.

*See: International Code of Marketing of Breast Milk Substitutes, adopted by the World Health Assembly in Resolution WHA 34.22, May 1981.
 Importance of Breastfeeding: (i) immediately after delivery, breast milk is yellowish and sticky. This milk is called colostrum, which is secreted during the first week of delivery. Colostrum is more nutritious than mature milk because it contains more protein, more anti-infective properties which are of great importance for the infant's defense against dangerous neonatal infections. It also contains higher levels of Vitamin 'A'. (ii) breast milk - A) is, a complete and balanced food and provides all the nutrients needed by the infant [for the first six months of life] (B) has anti-infective properties that protect the infants from infection in the early months (C) is always available; (D) needs no utensils or water (which might, carry germs) or fuel for its preparation, (iii) breastfeeding is much cheaper than feeding infant milk substitutes as the cost of the extra food needed by the mother is negligible compared to the cost of feeding infant milk substitutes, (iv) Mothers who breast-feed usually have longer periods of infertility after child birth than non-lactators; (b) details of management of breast feeding, as under: (i) breast-feeding - (A) immediately after delivery enables the contraction of the womb and helps the mother to regain her figure quickly; (B) is successful when the infant suckles frequently and the mother wanting to breast-feed is confident in her ability to do so (ii) in order to promote and support breast-feeding the mother's natural desire to breast-feed should always be encouraged by giving, where needed, practical advice and making sure that she has the support of her relatives, (iii) adequate care for the breast and nipples should be taken during pregnancy, (iv) it is also necessary to put the infant to the breast as soon as possible after delivery, (v) let the mother and the infant stay together after the delivery, the mother and her infant should be allowed to stay together (in hospital, this is also called 'rooming-in'); (vi) give the infant colostrum as it is rich in many nutrients and anti-infective factors protecting the infants from infections during the few days of its birth; (vii) the practice of discarding colostrum and giving sugar water, honey water, butter or other concoctions instead of colostrum should be very strongly discouraged; (viii) let the infants suckle on demand; (ix) every effort should be made to breast-feed the infants whenever they cry; (x) mother should keep her body and clothes and that of the infant always neat and clean.

Breast-feeding is the best form of nutrition for babies and provides many benefits to babies and mothers. It is important that, in preparation for and during breast-feeding, you eat a healthy, balanced diet. Combined breast and bottle-feeding in the first weeks of life may reduce the supply of your own breast-milk and reversing the decision not to breast-feed is difficult. Always consult your Healthcare Professional for advice about feeding your baby. The social and financial implications of using infant formula should be considered. Improper use of an infant formula or inappropriate foods or feeding methods may present a health hazard. If you use infant formula, you should follow manufacturer's instructions for use carefully - failure to follow the instructions may make your baby ill.

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