

## Supporting Neurodevelopment With Brain-Building Nutrition

- Ballard O, Morrow AL. Human milk composition: nutrients and bioactive factors. *Pediatr Clin North Am*. 2013;60(1):49-74. doi:10.1016/j.pcl.2012.10.002
- Colombo J, Harris CL, Wampler JL, et al. Improved neurodevelopmental outcomes at 5.5 years of age in children who received bovine milk fat globule membrane and lactoferrin in infant formula through 12 months: a randomized controlled trial. *J Pediatr*. 2023;261:113483. doi:10.1016/j.jpeds.2023.113483
- Colombo J, Shaddy DJ, Gustafson K, et al. The Kansas University DHA Outcomes Study (KUDOS) clinical trial: long-term behavioral follow-up of the effects of prenatal DHA supplementation. *Am J Clin Nutr*. 2019;109(5):1380-1392. doi:10.1093/ajcn/nqz018
- Cormack BE, Harding JE, Miller SP, Bloomfield FH. The influence of early nutrition on brain growth and neurodevelopment in extremely preterm babies: a narrative review. *Nutrients*. 2019;11(9):2029. doi:10.3390/nu11092029
- Costello SE, Geiser E, Schneider N. Nutrients for executive function development and related brain connectivity in school-aged children. *Nutr Rev*. 2021;79(12):1293-1306. doi:10.1093/nutrit/nuaa134
- de Weerth C, Aatsinki AK, Azad MB, et al. Human milk: from complex tailored nutrition to bioactive impact on child cognition and behavior. *Crit Rev Food Sci Nutr*. 2023;63(26):7945-7982. doi:10.1080/10408398.2022.2053058
- Dobbing J, Sands J. Comparative aspects of the brain growth spurt. *Early Hum Dev*. 1979;3(1):79-83. doi:10.1016/0378-3782(79)90022-7
- Holmboe K, Larkman C, de Klerk C, et al. The early childhood inhibitory touchscreen task: A new measure of response inhibition in toddlerhood and across the lifespan. *PLOS One*. 2021;16(12):e0260695. doi:10.1371/journal.pone.0260695
- Gallier S, Vocking K, Post JA, et al. A novel infant milk formula concept: mimicking the human milk fat globule structure. *Colloids Surf B Biointerfaces*. 2015;136:329-339. doi:10.1016/j.colsurfb.2015.09.024
- Gilmore JH, Knickmeyer RC, Gao W. Imaging structural and functional brain development in early childhood. *Nat Rev Neurosci*. 2018;19(3):123-137. doi:10.1038/nrn.2018.1
- Hedrick J, Yeiser M, Harris CL, et al. Infant formula with added bovine milk fat globule membrane and modified iron supports growth and normal iron status at one year of age: a randomized controlled trial. *Nutrients*. 2021;13(12):4541. doi:10.3390/nu13124541
- Hernell O, Timby N, Domellöf M, Lönnerdal B. Clinical benefits of milk fat globule membranes for infants and children. *J Pediatr*. 2016;173 Suppl:S60-S65. doi:10.1016/j.jpeds.2016.02.077
- Horta BL, Loret de Mola C, Victora CG. Breastfeeding and intelligence: a systematic review and meta-analysis. *Acta Paediatr*. 2015;104(467):14-19. doi:10.1111/apa.13139
- Hussain G, Wang J, Rasul A, et al. Role of cholesterol and sphingolipids in brain development and neurological diseases. *Lipids Health Dis*. 2019;18(1):26. doi:10.1186/s12944-019-0965-z
- Jaramillo-Ospina AM, Mujica-Coopman MF, Murguía-Peniche T, et al. Micronutrient, metabolic, and inflammatory biomarkers through 24 months of age in infants receiving formula with added bovine milk fat globule membrane through the first year of life: a randomized controlled trial. *J Nutr*. 2023;153(2):511-522. doi:10.1016/j.tjnut.2022.12.006

- Jiang B, Xia Y, Zhou L, et al. Safety and tolerance assessment of milk fat globule membrane-enriched infant formulas in healthy term Chinese infants: a randomised multicenter controlled trial. *BMC Pediatr.* 2022;22(1):465. doi:10.1186/s12887-022-03507-8
- Li F, Wu SS, Berseth CL, et al. Improved neurodevelopmental outcomes associated with bovine milk fat globule membrane and lactoferrin in infant formula: a randomized, controlled trial. *J Pediatr.* 2019;215:24-31.e8. doi:10.1016/j.jpeds.2019.08.030
- Li X, Peng Y, Li Z, et al. Feeding infants formula with probiotics or milk fat globule membrane: a double-blind, randomized controlled trial. *Front Pediatr.* 2019;7:347. doi:10.3389/fped.2019.00347
- Meek JY, Noble L; Section on Breastfeeding. Policy Statement: Breastfeeding and the Use of Human Milk. *Pediatrics.* 2022;150(1):e2022057988. doi:10.1542/peds.2022-057988
- Meule A. Reporting and interpreting task performance in go/no-go affective shifting tasks. *Front Psychol.* 2017;8:701. doi:10.3389/fpsyg.2017.00701
- Mohamed HJJ, Lee EKH, Woo KCK, Sarvananthan R, Lee YY, Mohd Hussin ZA. Brain-immune-gut benefits with early life supplementation of milk fat globule membrane. *JGH Open.* 2022;6(7):454-461. doi:10.1002/jgh3.12775
- Nie C, Zhao Y, Wang X, et al. Structure, biological functions, separation, properties, and potential applications of milk fat globule membrane (MFGM): a review. *Nutrients.* 2024;16(5):587. doi:10.3390/nu16050587
- Nieto-Ruiz A, Diéguez E, Sepúlveda-Valbuena N, et al. The effects of an infant formula enriched with milk fat globule membrane, long-chain polyunsaturated fatty acids and COGNIS study. *Nutrients.* 2020;12(12):3825. doi:10.3390/nu12123825
- Save the Children Fund. Food for Thought. 2013. Accessed May 31, 2024. <https://www.savethechildren.org.uk/content/dam/global/reports/hunger-and-livelihoods/food-for-thought.pdf>.
- Schwarzenberg SJ, Georgieff MK; Committee on Nutrition. Advocacy for improving nutrition in the first 1000 days to support childhood development and adult health. *Pediatrics.* 2018;141(2):e20173716. doi:10.1542/peds.2017-3716
- Shankle WR, Rafii MS, Landing BH, Fallon JH. Approximate doubling of numbers of neurons in postnatal human cerebral cortex and in 35 specific cytoarchitectural areas from birth to 72 months. *Pediatr Dev Pathol.* 1999;2(3):244-259. doi:10.1007/s100249900120
- Timby N, Adamsson M, Domellöf E, et al. Neurodevelopment and growth until 6.5 years of infants who consumed a low-energy, low-protein formula supplemented with bovine milk fat globule membranes: a randomized controlled trial. *Am J Clin Nutr.* 2021;113(3):586-592. doi:10.1093/ajcn/nqaa354
- Timby N, Domellöf E, Hernell O, Lönnerdal B, Domellöf M. Neurodevelopment, nutrition, and growth until 12 mo of age in infants fed a low-energy, low-protein formula supplemented with bovine milk fat globule membranes: a randomized controlled trial. *Am J Clin Nutr.* 2014;99(4):860-868. doi:10.3945/ajcn.113.064295
- Timby N, Domellöf M, Lönnerdal B, Hernell O. Supplementation of infant formula with bovine milk fat globule membranes. *Adv Nutr.* 2017;8(2):351-355. doi:10.3945/an.116.014142

## Supporting Neurodevelopment With Brain-Building Nutrition

---

Timby N, Hernell O, Vaarala O, Melin M, Lönnerdal B, Domellöf M. Infections in infants fed formula supplemented with bovine milk fat globule membranes. *J Pediatr Gastroenterol Nutr.* 2015;60(3):384-389. doi:10.1097/MPG.0000000000000624

Wei W, Yang J, Yang D, et al. Phospholipid composition and fat globule structure i: comparison of human milk fat from different gestational ages, lactation stages, and infant formulas. *J Agric Food Chem.* 2019;67(50):13922-13928. doi:10.1021/acs.jafc.9b04247

University of Utah. Developmental anatomy. Updated May 2020. Accessed May 31, 2024. [https://neurologicexam.med.utah.edu/pediatric/html/dev\\_anatomy.html](https://neurologicexam.med.utah.edu/pediatric/html/dev_anatomy.html).

Xia Y, Jiang B, Zhou L, et al. Neurodevelopmental outcomes of healthy Chinese term infants fed infant formula enriched in bovine milk fat globule membrane for 12 months - a randomized controlled trial. *Asia Pac J Clin Nutr.* 2021;30(3):401-414. doi:10.6133/apjcn.202109\_30(3).0007

Zelazo PD. The Dimensional Change Card Sort (DCCS): a method of assessing executive function in children. *Nat Protoc.* 2006;1(1):297-301. doi:10.1038/nprot.2006.46

Zhao X, Shi J, Dai F, et al. Brain development from newborn to adolescence: evaluation by neurite orientation dispersion and density imaging. *Front Hum Neurosci.* 2021;15:616132. doi:10.3389/fnhum.2021.616132



ANNENBERG CENTER FOR HEALTH SCIENCES  
AT EISENHOWER  
*Imparting knowledge. Improving patient care.*

This activity is supported by an educational grant from **Mead Johnson Nutrition.**