

7 DECADES OF RESEARCH

MFGM & its Components

1950 → 1990



Advances in **analytical methods** led to recognition of MFGM & its components

1950 Polonovski et al. Extraction of xanthine dehydrogenase from milk	1986 Zeisel et al. PL and SM in HM, BM, IF
1968 Morrison PL levels in milks	1986 Laegrid et al. GG composition of HM and BM
1972 Bracco et al. Lipid composition of MFGM	1988 Hundrieser and Clark Method to separate and measure PL classes
1984 Bitman et al. PL levels over lactation	

KEY GUIDE ■ Analytical ■ Pre-clinical ■ Clinical
SM: sphingomyelin; PL: phospholipid; HM: human milk;
BM: bovine milk; GG: ganglioside; IF: infant formula

Preclinical studies explore mode of action in the brain, gut, and immune system



1990 → 2010

1993 Mei and Zheng Exogenous GG on learning and memory in rats	2007 Susuki et al. GG, myelination and nerve function
1997 Fong et al. GG improves learning and memory in aged rats	2008 Clare et al. Antimicrobial functions of MFGM
1998 Rueda GG improves gut flora in preterm infants	2008 Jung et al. GG improves spatial learning and memory in rats
1998 Carlson Phospholipids reduced complications associated with prematurity	2009 McJarrow et al. A review on dietary GG and brain development
2003 Oshida et al. Dietary SM and myelination in rats	2009 Schnabl et al. GG can be taken up by intestinal cells
2003 Wang, et al. Brain GG in BF and FF infants	2009 Vickers et al. Complex milk lipid supplementation improves cognition in rats



Over 2000 studies published on MFGM and its components and the evidence continues to grow...

Clinical evidence supports MFGM's role in cognition and immune health in early life



2010 → 2020

2011 Zavaleta et al. MFGM enriched foods improve diarrhea in infants	2016 Ten Bruggencate et al. MFGM and immune outcomes in adults
2012 Gurnida et al. Complex milk lipids associated with cognitive development in 6 month infants	2017 Timby et al. MFGM and infant oral microbiota
2012 Veereman-Wauters et al. MFGM improves parent reported behavior regulation and febrile episodes in children	2019 Li et al. MFGM in infant formula supports normal growth and tolerance
2013 Tanaka et al. SM-enriched formula improves multiple development measures in preterm infants	2019 Li et al. MFGM and Lactoferrin support cognitive development in infants
2014 Billeaud et al. Safety and tolerance of MFGM enriched formulas	2019 Norris et al. Safety of maternal supplementation with GG-enriched complex lipids during pregnancy
2014 Timby et al. MFGM and neurodevelopments in infants	2019 Nieto-Ruiz et al. Long term follow-up after feeding infant formula with multiple functional ingredients, incl MFGM
2014 Timby et al. MFGM and cardiovascular markers in infants	2019 He et al. Metabolome analyses of MFGM intervention trial in infants
2015 Timby et al. MFGM and infections in infants	

Clinical evidence on **long-term** cognitive benefits to 5.5 - 6 year olds



2020 → Now

2021 Chichlowski et al. Gut microbiota and metabolome of infants fed formula with MFGM and lactoferrin	2023 Deoni et al. [abstract] MFGM intake associated with enhanced brain myelination and cognitive function
2021 Xia et al. GG-enriched complex lipid ingredient in formula and developmental milestones	2023 Colombo et al. 5.5 years follow-up after feeding infant formula with MFGM+LF
2022 Lazarte et al. [abstract] 13 years follow-up after feeding infants with complementary foods supplemented with MFGM	
2022 Nieto-Ruiz et al. Follow-up of children at 6 years old, who were fed with a combination of functional components including MFGM and DHA during infancy	

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