Physiological Effects of Feeding Infants and Young Children Formula Supplemented with Milk Fat Globule Membranes

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An increasing number of studies have reported different health benefits from oral supplementation with bovine milk fat globule membrane (MFGM) to infants and children (Table 1) [1, 2]. MFGM is a biologically active milk fraction that contains a large proportion of milk phospholipids, sphingomyelins, and gangliosides together with several hundred identified proteins, including mucins, butyrophilin, lactoferrin, and lactadherin (Fig. 1). Formula-fed infants are of special interest with respect to MFGM supplementation since they have a lower intake of MFGM components compared to breast-fed infants because, traditionally, the MFGM fraction is discarded with the milk fat when this is replaced by vegetable oils as the fat source in infant formulas.

Clinical Studies on the Effects of MFGM Concentrates Fed to Infants and Children

In the first double-blind, randomized, controlled trial (DBRCT) in 550 healthy, primarily breast-fed 6- to 11-month-old infants, supplementation with an MFGM-enriched protein fraction reduced diarrheal morbidity [3]. In another DBRCT in 70 infants, supplementation with bovine milk gangliosides, provided as a complex bovine milk lipid fraction from 2–8 until 24 weeks of age, increased hand-eye coordination, performance, and general IQ after adjustment for socioeconomic background variables [4]. A third DBRCT including 253 preschool children aged 2.5–6 years evaluated a daily intake of a formula enriched with 500 mg of phospholipids with the addition of a phospholipid-rich MFGM concentrate for 4 months, and found reduced days with fever and less behavioral problems during the intervention [5]. In an Indian DBRCT, 450 infants between 8
and 24 months of age were randomized to a daily dose of milk powder supplemented with 2 g of a spray-dried ganglioside concentrate or milk powder only for 12 weeks [6]. There was no difference between the groups either in the primary outcome rotavirus diarrhea or in the secondary outcomes, including all-cause diarrhea. However, the authors noted that the incidence of rotavirus diarrhea during the study period was lower than expected, making the study underpowered compared to the intention of the design. In a Swedish DBRCT in 160 formula-fed healthy term infants, supplementation with a protein-rich MFGM fraction from <2 until 6 months of age improved cognitive scoring in Bayley III [7]. Further, a reduced incidence of acute otitis media, a reduced antipyretic use, lower concentrations of serum IgG against pneumococci after vaccination, and a lower prevalence of Moraxella catarrhalis in the oral microbiota suggested
an infection-protective effect of MFGM supplementation [8, 9]. In a non-inferiority DBRCT in 199 healthy term infants from 14 days to 4 months of age, a formula enriched with lipids and a formula with a protein-rich bovine MFGM fraction yielded a noninferior weight gain with no serious adverse events compared with a standard formula [10].

**Conclusions**

Studies investigating the effect of bovine MFGM-supplemented diets on infants and children have shown promising results regarding both neurodevelopment and defense against infections. However, the scientific base of knowledge for MFGM supplementation to infants and children
is still limited. The number of studies published on MFGM provided to infants and children is small, and the interventions are heterogeneous: different MFGM concentrates have been given for different durations at different infant/child ages and with different main outcomes. However, MFGM supplementation seems safe down to the age of the first week of life in term infants, as no serious adverse effects have been reported.

Infant formulas supplemented with bovine MFGM concentrates have already been launched on many markets, but before firm conclusions can be drawn on the likely health benefits of supplementing the diet of infants and children with MFGM, more high quality DBRCTs are needed.

References