Efficient In Vitro Digestion of Lipids and Proteins in Bovine Milk Fat Globule Membrane (MFGM) Ingredient and Infant Formula Containing MFGM

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Objectives: The relative immaturity of the infant digestive system after birth has the potential to affect the bioaccessibility of dietary lipids, proteins and their digested product. The in vitro digestion of lipids and protein in bovine milk fat globule membrane (MFGM) ingredient and infant formula without and with MFGM ingredient (bovine source), as well as the partitioning of non-digested and products of digestion in bioaccessible fraction of chyme were measured. Conditions that simulate those in the stomach and small intestine of infants were used.

Methods: MFGM ingredient and whey/casein-based infant formula with and without 6%MFGM ingredient were digested using static, two-phase *in vitro* digestion model with conditions simulating those in the infant gut. Digestion and bioaccessibility of lipids were monitored by measuring a wide lipid profile using direct infusion-mass spectrometry (DI-MS/MS). Digestion of proteins were determined by denaturing polyacrylamide gel electrophoresis, with quantitative imaging of all blue stained bands.

Results: Cholesterol esters, diacylglycerides, triacylglycerides, phosphatidylcholines, and phosphatidylethanolamines in the MFGM ingredients were readily hydrolyzed resulting in marked increases in the amounts of free fatty acids and lyso-phospholipids in the bioaccessible fraction of chyme. In contrast, sphingomyelins, ceramides and GM3 gangliosides were relatively resistant to digestion. Protein in MFGM ingredient and infant formula without and with added MFGM ingredient also were efficiently digested.

Conclusions: The results suggest proteins, neutral lipids and phospholipids in MFGM are efficiently digested using conditions that simulate those in the prandial lumen of the stomach and small intestine of infants. Also, the profile of lipid and protein digestion is similar for whey/casein-based infant formula without and with MFGM ingredient using conditions that simulate those in the infant gut.

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