

Effects of Milk Polar Lipids on Cardiometabolic Disease Risk Factors, Gut Microbiome, and Lipid Metabolites in Healthy Adults

Liya Anto, Paige Dossias, Erin Wu, Chelsea Garcia, Sarah Wen Warykas, and Christopher Blesso

University of Connecticut

Objectives: Dietary modification to manage blood lipids is recommended as the primary preventive strategy for atherosclerosis. Polar lipids from milk (phospholipids and sphingolipids) have hypolipidemic effects and dose-dependently reduce intestinal cholesterol absorption in rodent models. The objective of the current study was to evaluate the effect of supplementation of milk polar lipids (MPL) added to milk fat on serum lipids, gut microbiome, and lipid metabolites in healthy adults.

Methods: Nineteen healthy adults (age: 28.7 ± 5.8 , BMI: 22.1 ± 5.6) consumed either 5.3 g/day of MPL-rich powder containing 20 g/day milk fat or a nutritionally matched milk fat-containing control powder (0.3 g MPL/day) for 4 weeks, separated by a 3-week washout period in a randomized, single-blinded crossover study. The primary outcome of the study was serum total cholesterol. Secondary outcomes were other serum lipids, anthropometric measurements, gut microbiome, and fecal and plasma metabolites.

Results: Consumption of additional 5 g/day of MPL did not alter serum lipid concentrations when compared to the control. However, the additional MPL attenuated the increase in waist circumference participants experienced when consuming control powder. MPL consumption increased the levels of total ceramides and very-long-chain fatty acids (VLCFAs) in stool compared to control, while an increase in plasma d39:1 ceramide was observed after supplementing with MPL when compared to the baseline. There was also an increase in fecal acyl alpha-hydroxyl fatty acid (AAHFA) 2:0/24:0, which was found to be positively correlated with the VLCFAs, after consuming the MPL powder. The MPL and control powder significantly reduced the relative abundance of gut bacteria belonging to the order Clostridiales when compared to baseline. However, no other changes in gut microbiota composition were observed with MPL or control supplementation compared to baseline.

Conclusions: MPL consumption did not influence serum lipids or gut microbiome composition in this cohort of healthy adults. However, it was shown to increase sphingolipid metabolites in the plasma and feces.

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