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Milk Polar Lipids Reduce Cholesterolemia by Decreasing Cholesterol Absorption in Humans (P06-041-19)

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Objectives: Nutritional strategies can play a major role in the management of cholesterolemia, notably in postmenopausal women at risk of CVD. Interest has recently grown on the potential health benefits of milk polar lipids (MPL). We showed that isolipidic enrichment of the diet with MPL improved several lipid CV risk factors but underlying mechanisms remained unclear. We hypothesized that MPL reduce intestinal cholesterol absorption in humans.

Methods: We performed a double-blind randomized controlled trial in 58 postmenopausal women with fasting HDL-cholesterol < 1.6 mM. They were subjected to a 4-week dietary intervention with daily consumption of a cream-cheese containing 12 g of milk fat including either 0 g (control, $n = 19$), 3 g ($n = 19$) or 5 g ($n = 20$) of MPL. Before and after each intervention, blood lipids were measured in the whole cohort whereas fecal lipids and coprostanol were analyzed in a subgroup ($n = 7$–9 per group). A proof-of-concept mechanistic crossover study was also carried out in 4 ileostomized subjects who performed 8h-postprandial tests after consuming 0g-, 3g- or 5g-MPL enriched cheese labelled with 2H-cholesterol tracer. Plasma, chylomicrons and ileal efflux were analyzed.

Results: Milk fat enriched with 3 to 5 g MPL induced dose-response reductions in serum total cholesterol (up to -6.8% in 5 g group, $p < 0.05$), LDL-cholesterol (-8.7%, $p < 0.05$) and HDL/total-cholesterol ratio ($p < 0.001$), compared to the control that had no effect. Fecal excretion of coprostanol increased after MPL supplementation ($p < 0.05$, 3g- and 5g-MPL vs control), and the fecal coprostanol/cholesterol ratio was inversely correlated with serum total- and LDL-cholesterol after intervention ($r = -0.5$, $p < 0.05$). In ileostomized subjects, postprandial accumulation of 2H-cholesterol in plasma and chylomicrons was reduced after 3 to 5 g MPL consumption ($p < 0.05$, vs control). Both cholesterol and milk sphingomyelin increased in ileal efflux after MPL enriched cheeses ($p < 0.05$).

Conclusions: Present results suggest that milk polar lipids decrease cholesterol absorption in humans through interactions with sphingomyelin and by increasing conversion of cholesterol to coprostanol.

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