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Interesterification of a commonly consumed palm-based hard fat blend does not affect postprandial lipoprotein metabolism in healthy older adults

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Abstract

Interesterified (IE) fats are widely used to replace partially-hydrogenated fats as hard fats with functional and sensory properties needed for spreads/margarines, baked goods, and confectionary, while avoiding the health hazards of *trans* fats. Detailed mechanistic work to determine the metabolic effects of interesterification of commonly-consumed hard fats has not yet been done. Earlier studies using fats less commonly consumed have shown either neutral or a lowering effect on postprandial lipaemia. We investigated postprandial lipaemia, lipoprotein remodelling, and triacylglycerol-rich lipoprotein (TRL) fraction apolipoprotein concentrations following a common IE blend of palm oil/kernel fractions versus its non-IE counterpart, alongside a reference monounsaturated (MUFA) oil. A 3-armed, double blind, randomized controlled trial (clinicaltrials.gov NCT03191513) in healthy adults (n = 20; 10 men, 10 women) aged 45–75 y, assessed effects of single meals (897 kcal, 50 g fat, 16 g protein, 88 g carbohydrate) on postprandial plasma triacylglycerol (TAG) concentrations, lipoprotein profiles, and TRL fraction apolipoprotein B48 and TAG concentrations. Test fats were IE 80:20 palm stearin/palm kernel fat, the equivalent non-IE fat, and a high-MUFA reference oil (rapeseed oil, RO). Blood was collected at baseline and hourly for 8 h. Linear mixed modelling was performed, adjusting for treatment order and baseline values (ver. 24.0; SPSS Inc., Chicago, IL, USA). Total 8 h incremental area under the curves (iAUC) for plasma TAG concentrations were lower following IE and non-IE compared with RO (mean difference in iAUC: non-IE vs. RO -1.8 mmol/L.h (95% CI -3.3, -0.2); IE vs. RO -2.6 mmol/L.h (95% CI -5.3, 0.0)), but iAUCs for IE and non-IE were not significantly different. There were no differences between IE and non-IE for chylomicron fraction apoB48 concentrations nor TAG:apoB48 ratio. No differences were observed between IE and non-IE for lipoprotein (VLDL, HDL, LDL) particle size or sub-class particle concentrations. However, LDL particle diameters were reduced at 5 and 6 h following IE vs RO ($P < 0.05$). XXL- (including chylomicron remnants and VLDL particles), XL- and L-VLDL particle concentrations (average diameters > 75, 64, and 53.6 nm respectively) were higher following IE and non-IE vs. RO at 6 h ($P < 0.05$) and 8 h postprandially ($P < 0.005$ – 0.05). In conclusion, both IE and non-IE palmitic acid-rich fats generated a greater preponderance of pro-atherogenic large TRL remnant particles in the late postprandial phase relative to an oleic acid-rich oil. However, the process of interesterification did not modify postprandial TAG response or lipoprotein metabolism.

Conflict of Interest

Jo Bruce is employed by ADM, a manufacturer of edible oils and fats. There are no other potential conflicts of interest to declare.