Postprandial Lipemic Response to Alpha-linolenic Acid Rich Oil, Butter and Olive Oil

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Postprandial lipemia varies with composition of dietary fat due to partitioning of fatty acids between β-oxidation, incorporation into triacylglycerols (TAG) and tissue lipids. Effects of α-linolenic acid (ALA) are poorly characterized.

Lipase-catalysed transesterification was used to produce a novel ALA-oil (35% ALA) from rapeseed and linseed oil. We hypothesized a lower postprandial lipemic response with ALA-oil than with olive oil and butter due to higher β-oxidation of ALA.

Two randomized crossover studies with 26 healthy men and 19 healthy women compared the effects on plasma lipids seven hours after a breakfast containing 35 g ALA-rich oil, butter fat or olive oil.

The men got higher postprandial lipemic response than the women. The incremental area under curve for plasma TAG was lower with butter than with olive oil (34%, p<0.05) and ALA oil (25%, ns) for men and 24 % (ns) lower with butter than with the other test-fats for women. After ALA-oil percentage ALA increased, in TAG to a level of 7 mol% (men and women) and in NEFA to 6 mol% (men) and 5 mol% (women) after 7 hours. Since total NEFA increased with time the amount of exogenous ALA in NEFA also increased. Palmitic acid mass in TAG and NEFA increased more after olive oil intake than after butter despite twice the intake of palmitic acid from butter.

Butter resulted in lower postprandial lipemia than the oils, the difference exceeding what is expected from the presence of short and medium chain fatty acids in butter. There was a considerable recirculation of ALA into the NEFA pool available for oxidation.