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SATgene dietary strategy to investigate the impact of the *apo E* genotype on LDL-cholesterol response to dietary fat manipulation

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There is emerging evidence that polymorphisms in the gene encoding for *apoE* impact on the LDL-cholesterol (LDL-C) response to dietary fat intake. It has been reported that carriers of the *apoE4* allele have higher plasma LDL-C concentrations after ingestion of saturated fat (SFA)⁽¹⁾ and docosahexanaeic acid (DHA) (>2g/d)⁽²⁾ compared with the *apoE3* wild-type. The aim of the SATgene study was to investigate the impact of a combination of SFA and DHA intake on plasma lipids according to *apoE* genotype.



Eighty-eight subjects were prospectively recruited according to *apoE* genotype (*n* 44 *E3/E3* and *n* 44 *E3/E4*) who were matched for age, gender and BMI. A flexible dietary exchange strategy, based on models previously developed by our group^(3,4) was employed to implement three iso-caloric diets with different fatty acid profiles sequentially: Participants consumed a low fat (LF) diet (28%E fat, 8%E SFA, 55%E carbohydrate (CHO)); High SFA (HSF) diet (38%E fat, 18%E SFA, 45%E CHO) and HSF-DHA diet (HSF diet + 3g/d DHA) each for an 8-week period. Commercially available spreads (LF spread (LF), butter (HSF)), oils and snacks (cereal bars, pretzels and rice cakes (LF) and chocolate bars, crisps and cakes (HSF)) were supplied to subjects to be consumed in exchange for habitual foods in order to replace the exchangeable fat in their diet. Subjects were also advised to adjust the quantity of carbohydrate and dairy products accordingly. Four 3-d weighed diet diaries were completed by the subjects (one at baseline and one during each of the dietary periods) and analysed using Dietplan 6.60 (Forestfield Software, UK).

Nutrient	LF (n = 82)			HSF n = 80			HSF-DHA n = 78			P value
	Mean	SEM	Target	Mean	SEM	Target	Mean	SEM	Target	
%E* fat	25.1 ^a	0.9	28	42.8 ^b	0.8	38	41.0 ^b	0.8	38	0.000
%E CHO	55.1 ^a	1.0	55	42.2 ^b	0.8	45	43.6 ^b	0.8	45	0.000
%E SFA	8.3 ^a	0.4	8	19.3 ^b	0.5	18	18.6 ^b	0.5	18	0.000
%E MUFA	8.3 ^a	0.4	12	14.0 ^b	0.4	12	13.5 ^b	0.3	12	0.000
%E PUFA	4.5	0.3	6	4.8	0.2	6	4.7	0.3	6	0.405
EPA (MG)	4.0 ^a	0.8		20.2 ^b	2.1		26.3 ^b	4.1		0.000
DHAQ (mg)	11.7 ^a	2.3		15.4 ^a	2.9		3017.3 ^b	3.7		0.000

SATgene dietary compositional targets were broadly met (see table). Total dietary fat (42.8%E and 41.0%E respectively v. 25.1%E) and SFA (19.3%E and 18.6%E, respectively v. 8.3%E) intakes were higher during the HSF compared with the LF diet (*P* = 0.000). In addition, the DHA intake was significantly higher in the HSA-DHA diet group (*P* = 0.000) relative to the two earlier dietary periods. Therefore the SATgene food exchange model was effective at implementation of the three experimental diets, which were well tolerated by the subjects.

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