

Exchanging Partially Hydrogenated Fat For Palmitic Acid In The Diet Increases LDL-cholesterol And Endogenous Cholesterol Synthesis In Normocholesterolemic Women

Sundram, Kalyana, French, Margaret A, Clandinin, M. Thomas. (2003). Exchanging partially hydrogenated fat for palmitic acid in the diet increases LDL-cholesterol and endogenous cholesterol synthesis in normocholesterolemic women. Eur. J. Nutr. 42(4):188-94

Partial hydrogenation of oil results in fats containing unusual isomeric fatty acids characterized by cis and trans configurations. Hydrogenated fats containing trans fatty acids increase plasma total cholesterol (TC) and LDL-cholesterol while depressing HDL-cholesterol levels. Identifying the content of trans fatty acids by food labeling is overshadowed by a reluctance of health authorities to label saturates and trans fatty acids separately. Thus, it is pertinent to compare the effects of trans to saturated fatty acids using stable isotope methodology to establish if the mechanism of increase in TC and LDL-cholesterol is due to the increase in the rate of endogenous synthesis of cholesterol. Ten healthy normocholesterolemic female subjects consumed each of two diets containing approximately 30% of energy as fat for a fourweek period. One diet was high in palmitic acid (10.6% of energy) from palm olein and the other diet exchanged 5.6% of energy as partially hydrogenated fat for palmitic acid. This fat blend resulted in monounsaturated fatty acids decreasing by 4.9 % and polyunsaturated fats increasing by 2.7%. The hydrogenated fat diet treatment provided 3.1% of energy as elaidic acid. For each dietary treatment, the fractional synthesis rates for cholesterol were measured using deuterium-labeling procedures and blood samples were obtained for blood lipid and lipoprotein measurements. Subjects exhibited a higher total cholesterol and LDL-cholesterol level when consuming the diet containing trans fatty acids while also depressing the HDL-cholesterol level. Consuming the partially hydrogenated fat diet treatment increased the fractional synthesis rate of free cholesterol. Consumption of hydrogenated fats containing trans fatty acids in comparison to a mixture of palmitic and oleic acids increase plasma cholesterol levels apparently by increasing endogenous synthesis of cholesterol.

Demographic Parameters Of Subjects

Group* (n : 10)	Height (cm)	Weight (base)	Weight (high sat)	Weight (high trans)
Female	154.20	56.86	56.80	57.10

* healthy, non-smokers, consumed no alcohol and were normolipemic

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Nutrient Intake Per Day

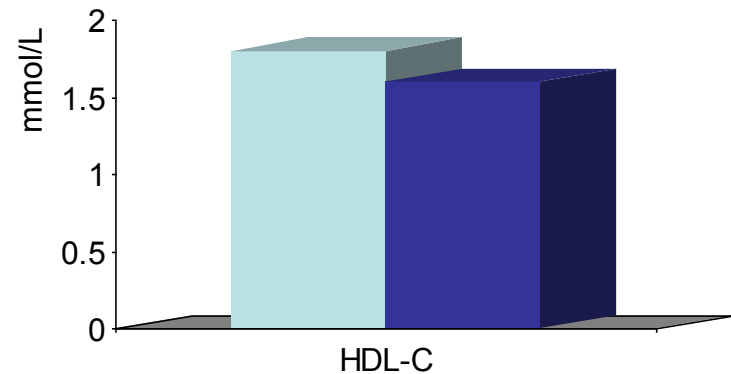
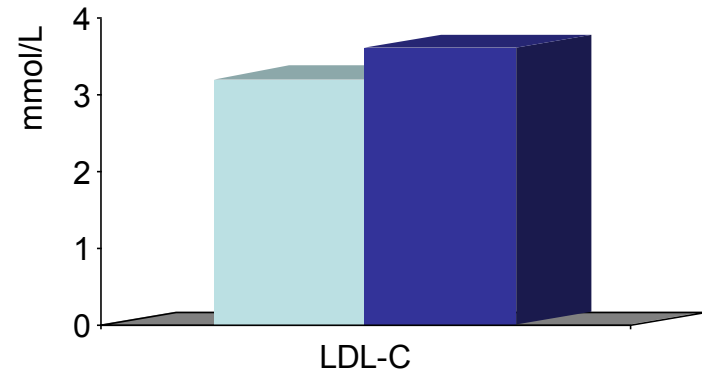
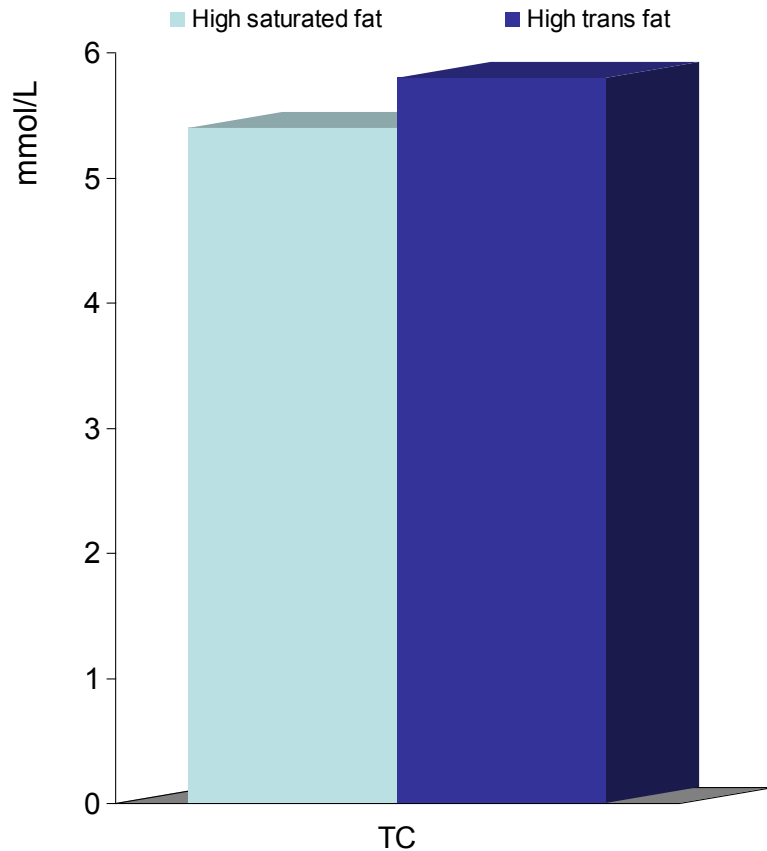
Nutrient	Baseline	High saturated fat	High trans fat
Total energy (kcal)	2112.00	2140	2070
Total fat	29.30	30.50	29.9
Protein	17.20	14.50	14.3
Carbohydrate	53.40	55.50	55.7
Cholesterol (mg)	-	213.00	205
SFA	13.20	13.00	8.14
10:0	0.15	n.d	0.08
12:0	1.16	0.47	0.86
14:0	0.70	0.46	0.48
16:0	9.77	10.60	4.54
18:0	1.35	1.31	2.06
MUFA	1.85	12.90	8.00
16:1 (n-9)	0.43	0.23	0.25
18:1 (n-9)	11.42	12.70	7.75
PUFA	3.41	3.80	6.54
18:2 (n-6)	3.20	3.54	5.80

Continued

18:3 (n-3)	0.14	0.11	0.49
22:6 (n-3)	0.08	0.14	0.25
Trans FA	n.d.	n.d.	5.59
18:1 (te)	n.d.	n.d.	3.13
18:1 (n-11t)	n.d.	n.d.	0.66
18:1 (n-13t)	n.d.	n.d.	1.14
18:2 (n-6t)	n.d.	n.d.	1.60
18:2 (n-6t)	n.d.	n.d.	0.25

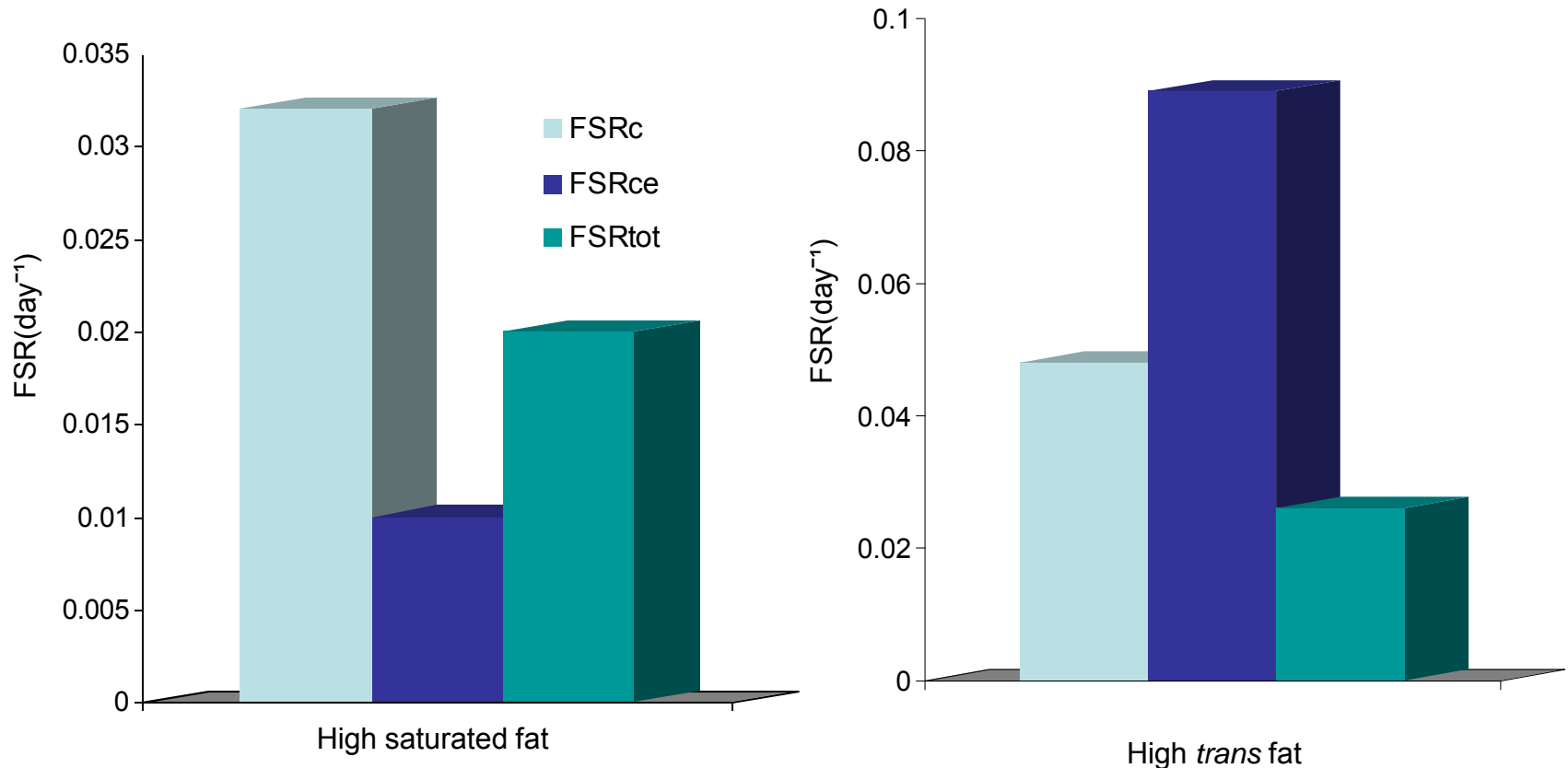
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The Effect Of Consuming High Saturated Fat And High Trans Fat Diets On Plasma Lipid And Lipoproteins Cholesterol Levels



Subjects exhibited higher total and LDL-cholesterol levels when consuming the diet containing trans fatty acids; Trans also depressed HDL-cholesterol

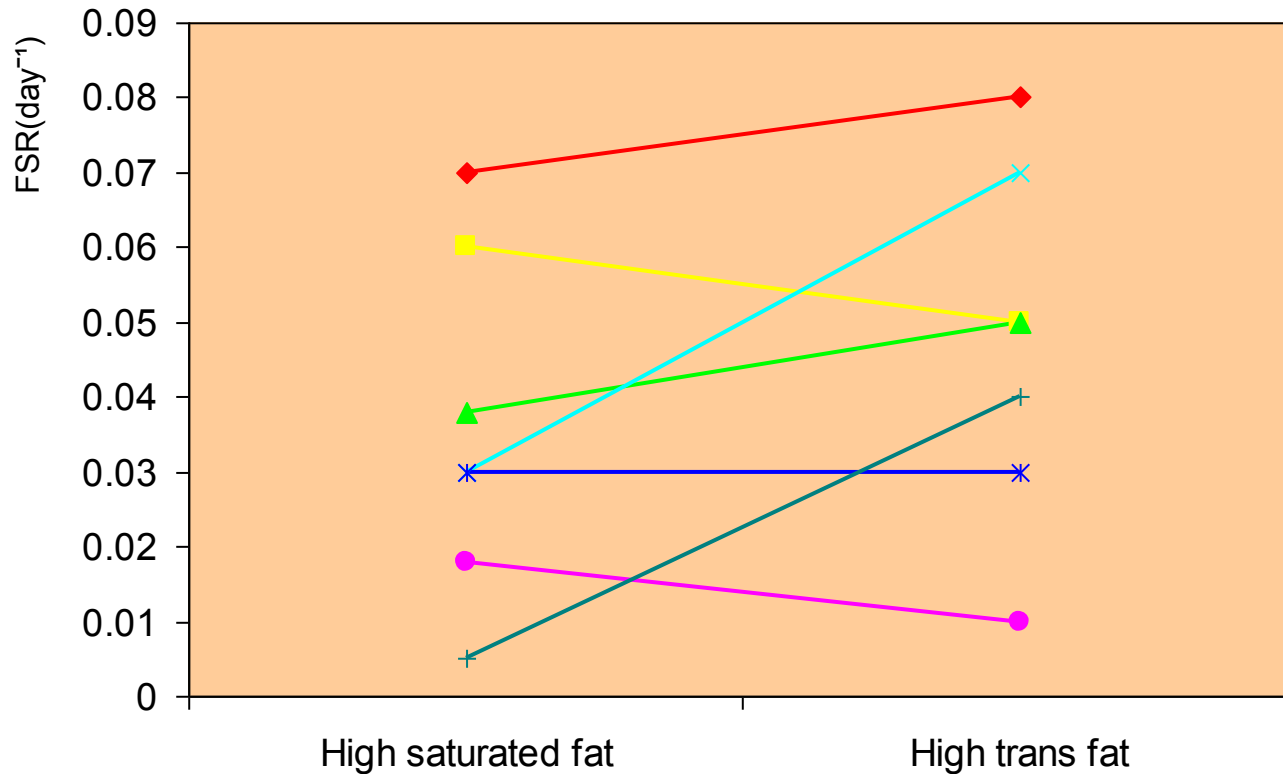
Effect Of Diet Treatment On Mean Fractional Synthesis Rate (FSR) For Free Cholesterol, Cholesteryl Ester and Total Cholesterol



Consumption of partially hydrogenated fat increased the fractional synthesis rate of free cholesterol.

FSRc: fractional synthesis rate for free cholesterol; FSRce: fractional synthesis rate for cholesteryl ester;
FSRtot: fractional synthesis rate for total cholesterol

Individual Subjects' Fractional Synthetic Rates Of Total Cholesterol After Consuming A Diet High In Saturated Fat And High In Trans Fat



Consumption of hydrogenated fats containing trans fatty acids in comparison to a mixture of palmitic and oleic acids increase plasma cholesterol levels.

Conclusion

The substitution of palmitic acid and oleic acid for hydrogenated fat containing trans fatty acids at a usual level of linolenic intake mitigates the hypercholesterolemic effects of dietary trans fatty acids

Consuming partially hydrogenated fat increased the fractional synthesis rate of free cholesterol.

Consumption of hydrogenated fats containing trans fatty acids in comparison to a mixture of palmitic and oleic acids increase plasma cholesterol levels apparently by increasing endogenous synthesis of cholesterol.

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