

Replacement Of Partially Hydrogenated Soybean Oil By Palm Oil In Margarine Without Unfavorable Effects On Serum Lipoproteins

Muller H, Jordal O, et al. (1998) Replacement of partially hydrogenated soybean oil by palm oil in margarine without unfavorable effects on serum lipoproteins. Lipids. 33(9):879-87

ABSTRACT: We have compared the effects of three different margarines, one based on palm oil (PALM-margarine), one based on partially hydrogenated soybean oil (TRANS-margarine) and one with a high content of polyunsaturated fatty acids (PUFA-margarine), on serum lipids in 27 young women. The main purpose of the study was to test if replacement of trans fatty acids in margarine by palmitic acid results in unfavorable effects on serum lipids. The sum of saturated fatty acids (12:0, 14:0, 16:0) was 36.3% of total fatty acids in the PALM-diet, the same as the sum of saturated (12:0, 14:0, 16:0) (12.5%) and trans (23.1%) fatty acids in the TRANS-diet. This sum was 20.7% in the PUFA-diet. The content of oleic acid was 37.9, 35.2, and 38.6%, respectively, in the three diets, whereas linoleic acid amounted to 16, 13.5, and 27.3%, respectively. Total fat provided 30-31% and the test margarines 26% of total energy in all three diets. The subjects consumed each of the diets for 17 d in a Latin-square crossover design. There were no significant differences in total cholesterol, low density lipoprotein (LDL)-cholesterol and apolipoprotein B (apoB) between the TRANS- and the PALM-diets. High density lipoprotein (HDL)-cholesterol and apoA-1 were significantly higher on the PALM-diet compared to the TRANS-diet whereas the ratio of LDL-cholesterol to HDL-cholesterol was lower, although not significantly ($P = 0.077$) on the PALM-diet. Total cholesterol, LDL-cholesterol, and apoB were significantly lower on the PUFA-diet compared to the two other diets. HDL-cholesterol was not different on the PALM- and the PUFA-diets but it was significantly lower on the TRANS-diet compared to the PUFA diet. Compared to the PUFA-diet the ratio of LDL- to HDL-cholesterol was higher on both the PALM- and the TRANS-diets whereas apoA-1 was not different. Triglycerides and lipoprotein (a) were not significantly different among the three diets. We concluded that nutritionally, palmitic acid from palm oil may be a reasonable alternative to trans fatty acids from partially hydrogenated soybean oil in margarine if the aim is to avoid trans fatty acids. A palm oil-based margarine is, however, less favorable than one based on a more polyunsaturated vegetable oil.

Characteristics of Subjects

Parameter	Mean (SD)	Range
Age (year)*	27 (5.8)	19 - 42
Weight (kg)	77.5 (13)	56.4 - 100
BMI (kg/m ²)	26.5 (4.1)	20 – 36

* Female (n = 27)

Average Daily Nutritional Intake of Subjects

Dietary intake	Mean
Total fat (% Energy)	31 (SD 5.7)
Saturated fatty acids (g)	29
Monounsaturated fatty acids (g)	26
PUFA (g)	13.9
Linoleic acids (g)	10.4
α -linolenic acids (d0)	1.4
Cholesterol (mg/d)	259 (SD 141)

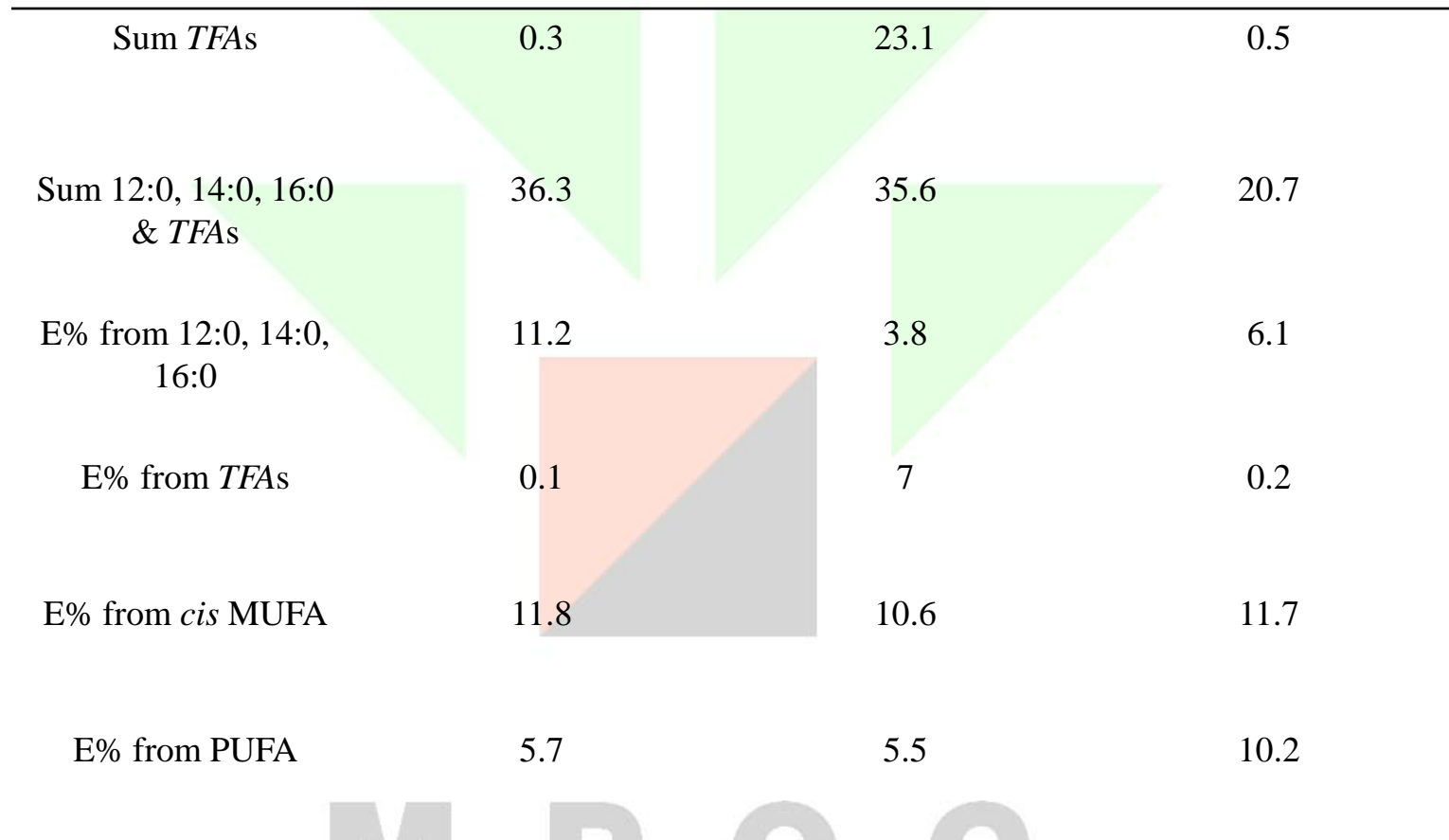
Fatty Acid Composition of the Test Diets

Fatty acid composition (% of total fatty acids)

Fatty acid	PALM-diet	TRANS-diet	PUFA-diet
12:00	0.5	0.5	2.6
14:00	1.6	1	1.8
16:00	33.9	11	15.8
16:1c	0.4	0.4	0.4
17:00	0.1	0.1	0.1
18:00	5.3	8.8	4.4
18:1t	0.1	22.6	0.2
18:1c	37.9	35.2	38.6
18:2t/c ^a	0.1	0.4	0.3
18:2c	16	13.5	27.3
18:3c	2.4	4.7	6.1
20:00	0.4	0.3	0.2
20:1t	0.1	0.1	0.2
22:00	0.2	0.3	0.3

M P O C

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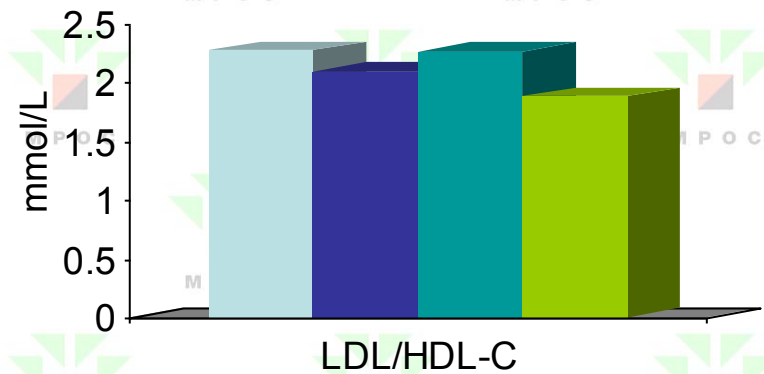
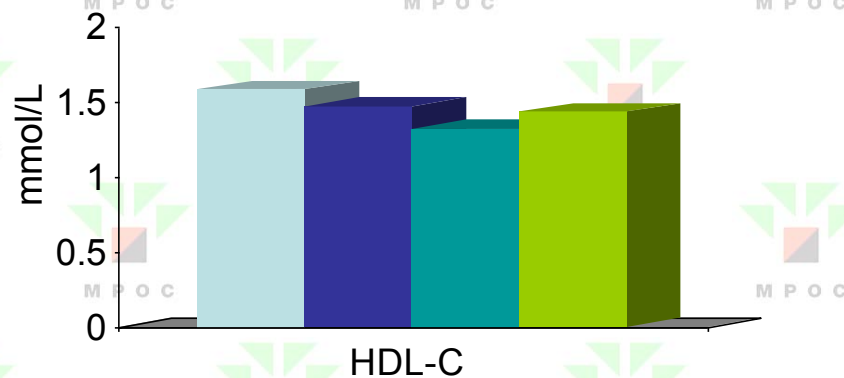
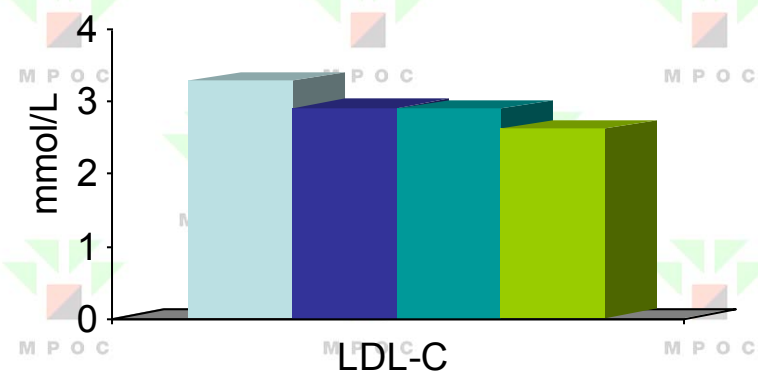
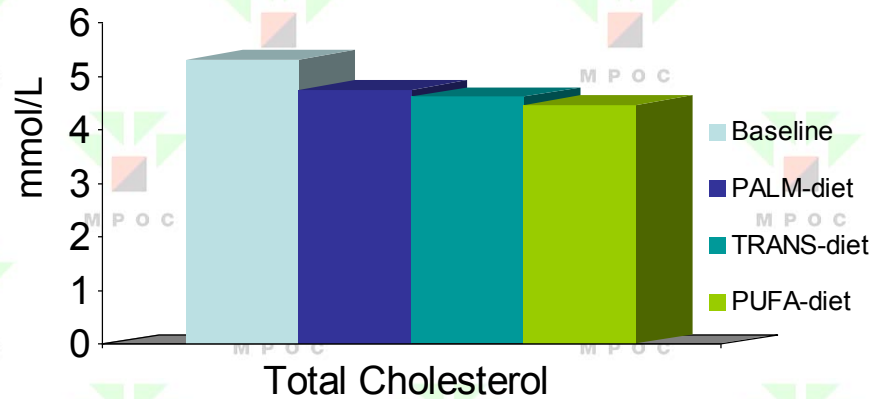
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Content of Energy and Nutrients of Duplicate Portions of the Test Diets

	PALM-diet	<i>TRANS</i> -diet	PUFA-diet
Energy (MJ)	8.40	8.35	8.48
Protein (E%)	17.7	17.1	17.2
Fat (E%)	31.0	30.1	30.4
Carbohydrate (E%)	51.3	52.8	52.4
Cholesterol (mg)	86	56	80

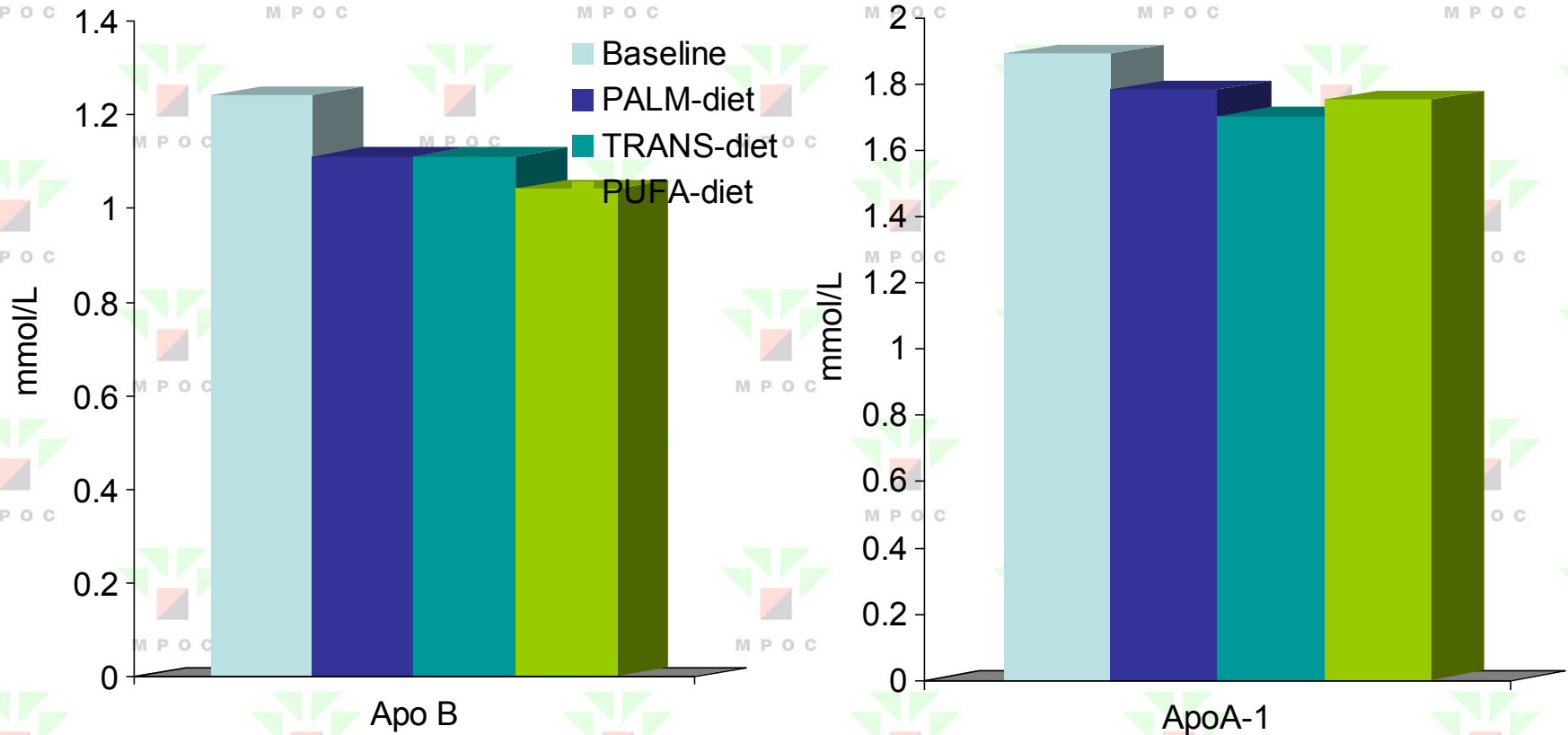
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Serum Lipid and Lipoprotein Levels at Baseline and Post-intervention



There were no significant differences in TC and LDL-C between PALM and Trans diets. However, HDL-C was sig. higher on the PALM diet.

Serum Lipid and Lipoprotein Levels at Baseline and Post-intervention



There were no significant differences in apolipoprotein B (apoB) between diets tested. However, ApoA-1 was significantly higher on the PALM-diet compared to the TRANS-diet

Conclusion

Palm oil may be a reasonable alternative to partially hydrogenated soybean oil in margarine production if the aim is to avoid trans fatty acids while maintaining the same degree of product functionality

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