

Trans fatty acid content of selected brands of West German Nut-nougat cream

M. D. Laryea, B. Biggemann, M. Funke, I. Lombeck, and H. J. Bremer*)

Department of Pediatrics, University of Düsseldorf, F.R.G.

*) Department of Pediatrics, University of Heidelberg, F.R.G.

Summary: The fatty acid composition including trans fatty acids of 12 brands of nut-nougat creams were analyzed by capillary gas chromatography. The creams consisted mainly of sugar and partially hydrogenated vegetable oil. The lipid content, which was quantified gravimetrically, amounted to between 30 and 38.2 % in the different brands. The fatty acid composition varied considerably between the different creams. Linoleic acid, the major polyunsaturated fatty acid (PUFA), ranged from 12 to 39 %. Palmitic acid (16:0), which was the main fatty acid, varied from 9 to 27 %. The total trans fatty acid content of the 12 creams ranged from 0.9 to 12.3 %. Only two of the creams contained less than 1 % of trans fatty acids; 18:1t was the trans fatty acid found in the greatest amounts, whereas 16:1t and 14:1t were only found in trace amounts. Three samples had amounts of 18:2tt, 18:2ct, and 18:2tc between 0.7 and 1.06 %; only small amounts of linoleate isomers were detected in the other creams.

Our results show that trans fatty acids are present in every brand of chocolate cream tested. Since the potential risk of arteriosclerosis and cancer resulting from the consumption of trans fatty acids is not yet clear, different ways of production should be used in order to eliminate them from the creams that are a preferred bread spread of infants and children.

Zusammenfassung: In zwölf verschiedenen Sorten von Nußnougat-Creme wurde die Fettsäurezusammensetzung einschließlich der trans-Fettsäuren mittels Kapillargaschromatographie untersucht. Die Cremes bestanden hauptsächlich aus Zucker und teilweise gehärteten Pflanzenfetten. In den verschiedenen Sorten betrug der gravimetrisch ermittelte Fettgehalt zwischen 30 und 38,2 %. Die verschiedenen Cremes wiesen deutliche Unterschiede in ihrer Fettsäurekomposition auf. Der Gehalt an Linolsäure, der wichtigsten mehrfach ungesättigten Fettsäure, schwankte zwischen 12 und 39 %. Der Anteil an Palmitinsäure (16:0), die den Hauptanteil an den gesättigten Fettsäuren ausmachte, variierte zwischen 9 und 27 %. Der Gesamtgehalt an trans-Fettsäuren lag zwischen 0,9 und 12,3 %, nur zwei Cremes enthielten weniger als 1 %. 18:1t stellte den größten Anteil an allen trans-Fettsäuren, während 14:1t und 16:1t nur in Spuren gefunden wurden. Drei Proben enthielten die Linolsäure-Isomere 18:2tt, 18:2ct und 18:2tc, jeweils in einem Bereich zwischen 0,7 und 1,06 % der Gesamtfettsäuren; in den restlichen Cremes wurden davon nur Spuren nachgewiesen.

Unsere Untersuchungen wiesen trans-Fettsäuren in jeder Form von Nußnougat-Creme nach. Da mögliche Zusammenhänge zwischen der Aufnahme von trans-Fettsäuren und der Entstehung von Tumorerkrankungen und Arteriosklerose ungeklärt sind, sollten andere Herstellungsverfahren verwendet werden, um die

trans-Fettsäuren aus den genannten Produkten zu eliminieren, zumal diese bevorzugt von Kindern als Brotaufstrich verzehrt werden.

Key words: nut-nougat cream, trans fatty acids, hydrogenated vegetable oil

Schlüsselwörter: Nußnougat-Creme, trans-Fettsäuren, gehärtete Pflanzenfette

Introduction

The increased dietary consumption of trans fatty acids during recent years has mainly been due to the augmented intake of hydrogenated vegetable oils. The hydrogenation of oils is carried out in order to improve the oxidative stability necessary for good flavor and longer storage and to achieve desirable spreading consistency (1). Only minor proportions of dietary trans fatty acids originate from dairy products and the fat of ruminants, in the forestomach of which trans fatty acids are formed by microbial biohydrogenation (2).

Although no definite proof exists that the consumption of trans fatty acids lead to serious illness and growth retardation in humans, the potential risks of dietary trans fatty acids are still under discussion, and many studies (mainly in experimental animals) have been performed (3). Trans fatty acids lack any essential fatty acid activity. They appear to increase the requirements for essential fatty acids, since they impede enzymatic desaturation and elongation of essential fatty acids (4, 5). Even very low concentrations of the desaturation products of trans isomers of linoleic acid are able to decrease synthesis of prostaglandins and thromboxans (6, 7). The cholesterol-raising effects of trans fatty acids are discussed controversially (8).

The most important dietary suppliers of trans fatty acids in industrial countries are margarines and shortenings; the latter make up 44 % of the regular dietary fat consumption of adults in the USA (9).

During recent years, the dietary intake of nut-nougat cream has steadily increased and this product has partially displaced margarine as a bread spread (10), particularly in the diets of infants and children. Whereas sufficient information is available on the trans fatty acid content of different margarines in different countries including West Germany (11, 12), to the best of our knowledge the trans fatty acid of the nut-nougat cream that contain hydrogenated vegetable oil has not yet been published. Data on the amount of trans fatty acids in children's food are necessary for investigations on the influence of diet on health and disease, as well as for recommending diets for general and specific purposes.

Material and Methods

Twelve different brands of nut-nougat and chocolate creams were purchased in local grocery stores. They were selected on the basis of availability. To determine whether there are important differences between batch samples, samples from different batches were also analyzed. After freeze-drying, total lipids were extracted with cyclohexane/ethanol (1:1 v/v) (13) and quantified gravimetrically.

After transesterification with methanolic HCl, fatty acid methylesters were analyzed on the basis of chain length and degree of unsaturation with a Dani 6500 HR

gas chromatograph I, equipped with a 50 mm tm sil 88 fused silica capillary column, temperature programmed from 70 to 195 °C with 28 °C/min, and from 195 to 220 °C with 15 °C/min (14). Peaks were identified by comparison with authentic standards and their areas quantified with a Shimadzu CR 3 A integrator. Results are expressed as weight percent of all fatty acids detected.

Results and Discussion

The brand names of all creams analyzed are listed in alphabetical order in Table 1. The fat contents of the creams analyzed ranged from 30 to 38.2 % (see Table 1). These values are lower than the fat contents of the usual bread spreads such as butter, margarine, cheese etc., of which the fat content ranges from 40 to 80 %.

Table 2 shows the main fatty acids of the brands analyzed. The creams exhibited great variety in terms of their content of saturated, monoenoic, and polyunsaturated fatty acids. The saturated fatty acids ranged from 14 to 32.5 %, the monoenoic acids from 35.8 to 63.6 %, and the PUFA from 12.7 to 45.4 %. The main saturated fatty acids were palmitate (C 16:0) and stearate (C 18:0); these varied from 9 to 27 %, and 4 to 7 %, respectively. Linoleic acid, the major polyunsaturated fatty acid, showed the widest range of all the fatty acids analyzed; it ranged from 11.97 to 39 %. From these data it was concluded that completely different vegetable oils are used for the production of the different brands, even though the products are apparently similar.

The total trans fatty acid content of the 12 creams ranged from 0.35 to 12.23 %. Only two of all the brands contained less than 1 % of the fatty acids; these were also the creams with the lowest linoleic acid contents. 18:1t constituted the major proportion of all trans fatty acids. Only small amounts of 14:1t and 16:1t were detected in the samples. Three brands of creams contained amounts of between 0.7 and 1.1 % for 18:2ct, 18:2tc, and 18:2tt, whereas in the other creams only trace amounts of the linoleate isomers were found.

When our data is compared with the data on the trans fatty acid content of West German margarines, it can be seen that the range of the trans fatty

Table 1. Trade marks of the 12 different brands of nut-nougat cream analyzed in alphabetical order and their gravimetrically determined fat content.

Ferrero Nutella	29.97 %	I
Hollandia Nuß Nougat	39.38 %	II
Neuform Hasel Nougat	35.89 %	III
No Name Nuß Nougat	31.06 %	IV
Nussenia Nuß Nougat	31.56 %	V
Nutoka Nuß Nougat	34.58 %	VI
Pitt Nuß Nougat	38.15 %	VII
Preiswert Nuß Nougat	31.49 %	VIII
Schwartau Schokomac	36.15 %	IX
Zentis Belmandel	33.27 %	X
Zentis Nusspli	31.22 %	XI
Zentis Schoko Creme	32.00 %	XII

Table 2. Fatty acid composition including trans fatty acids of 12 brands of nut-nougat cream.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
14:0	0.87	0.12	0.89	0.24	0.16	0.13	0.31	0.15	0.43	0.14	0.21	0.91
16:0	27.28	10.30	27.58	10.60	9.95	10.22	9.89	10.09	11.44	9.92	10.25	12.63
18:0	4.16	5.18	4.44	4.84	5.59	5.62	3.44	5.61	6.55	4.91	4.75	6.89
20:0	0.25	0.31	0.22	0.17	0.18	0.19	0.44	0.23	0.24	0.17	0.33	0.21
14:1c	ND	ND	0.03	ND	ND	ND	ND	ND	0.02	ND	ND	0.07
16:1c	0.27	0.13	0.26	0.16	0.13	0.13	0.28	0.09	0.18	0.23	0.10	0.28
18:1c	53.18	30.98	44.38	42.31	35.41	34.13	57.74	34.78	28.94	43.55	41.58	34.88
20:1c	0.50	0.52	0.51	0.21	0.52	0.51	0.73	0.21	0.20	0.50	0.52	0.20
18:2cc	11.97	39.60	19.48	25.94	35.66	36.58	15.87	36.91	39.08	28.33	27.53	27.04
18:3c6	0.04	0.48	0.08	0.34	0.66	0.53	0.49	0.34	0.26	0.22	0.34	0.33
18:3c3	0.23	4.61	1.45	1.93	3.10	3.62	4.11	3.70	4.82	2.03	2.42	2.61
14:1t	ND	ND	0.02	0.04	0.06	0.04	ND	ND	ND	ND	ND	0.05
16:1t	ND	ND	ND	0.05	0.04	0.03	0.04	ND	0.05	ND	ND	0.06
18:1t	0.49	6.35	0.14	9.13	6.37	6.30	3.91	6.34	6.19	8.14	8.84	9.86
20:1t	ND	0.05	ND	0.07	0.11	0.05	0.06	ND	ND	0.03	0.06	0.04
18:2ct	0.22	0.33	0.13	1.06	0.48	0.36	0.33	0.27	0.20	0.42	0.70	0.81
18:2tc	0.19	0.19	0.08	1.05	0.34	0.27	0.17	0.19	0.12	0.38	0.71	0.84
18:2tt	ND	0.09	ND	0.91	0.09	0.11	0.14	0.08	0.09	0.44	0.71	0.74
Sum sat	31.81	16.12	32.45	15.91	16.15	16.61	14.05	16.41	18.79	15.36	15.67	20.11
Sum monoene	54.19	38.20	45.07	52.28	43.00	41.43	63.58	41.80	35.82	52.40	51.16	45.69
PUFA	12.71	45.43	21.27	31.25	40.46	41.60	21.31	41.54	44.66	31.93	32.41	32.49
Sum trans	0.90	7.02	0.35	12.27	7.43	7.12	4.67	6.88	6.64	9.41	11.02	12.35
P/S	0.04	2.82	0.66	1.96	2.51	2.50	1.52	2.53	2.38	2.08	2.07	1.62

ND: not detectable

acids in the nut-nougat creams is not as great as that in the margarines where values for trans fatty acids between 0.1 and 34.7 % were found (12). Data on the trans fatty acid content of other foods in Germany are not available. Thus the daily intake of 6 g/day for men and 5 g/day for women of 18:1t is only estimated (15). Enig et al. (16) examined 220 different food items in the USA. He too found a great variation in the levels of trans fatty acid in margarine, shortenings, bakery products, confections, etc. Peanut butter, a bread spread that is widely used in the USA but not in West Germany, had no detectable quantities of trans fatty acids.

Trans fatty acids are incorporated into human tissues (17). They are found in adipose tissue, liver, heart, aorta, brain (18), and erythrocytes (19) of humans. Besides the potential increased risk of arteriosclerosis (20) some studies have suggested an epidemiological relationship between the dietary consumption of trans isomers and cancer (21). Therefore more information about the trans fatty acid content of different food items in adult's and children's diets should be available. Our results demonstrate that trans fatty acids are present in all the brands of nut-nougat cream tested and that only two of them contained less than 1 % of total fatty acids. As 30 % of margarines in West Germany are almost free of trans fatty acids it should also be possible to eliminate the trans isomers from nut-nougat creams and it appears highly desirable that this be done since these products are consumed mainly by infants and children.

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Authors' address:

Dr. M. D. Laryea, Universitäts-Kinderklinik, Moorenstraße 5, 4000 Düsseldorf