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Composition of fatty acids and triglycerides in human adipose tissue - Results from North-East Poland

(Short communication)

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The composition of fatty acids of human adipose tissue reflects the composition of fatty acids in diet [5, 7, 8, 10, 11]. It also depends to different extent on such factors as age [11, 13], sex [4, 11, 13], race [4, 13, 14], physical activity [18], physical condition (heart diseases) [14, 19] or adipose tissue kind [13].

Lack of data concerning the composition of fatty acids in adipose tissue of Poles made us undertake such studies. As there are no literature data available on triglyceride composition of human adipose tissue we decided to include this subject in our investigations.

Material and methods

Samples of perirenal adipose tissue were collected during anatomopathological examination at Medical Academy in Bialystok (North-East Poland). There were analysed 32 samples - 18 from men, 14 from women; 10 from people aged between 41-60, 22 from people aged between 61-91.

Fat was extracted from tissue according to Folch et al. [9]. Fatty acid composition after methylation according to Peisker [16] was determined with GLC in a gas chromatograph Pye Unicam 104 with FID joined with a recorder (Philips) and integrator Pye Unicam DP-88.

Separation conditions: glass column 2.1 m long, inside diameter 4 mm with 10 % DEGS + 20 % H_3PO_4 on Varaport 30 100-200 mesh. Temperature of column 195 C, of detector 250 C, of evaporator 225 C.

To analyse the composition of triglycerides fat dissolved in ethyl ether (5 % solution) was injected into the column.

Separation conditions: glass column 0.6 m long, inside diameter 4 mm with 3 % OV-17 on Chromosorb W/H/P 80-100 mesh. Programmed column temperature: 220-355 C, Δ 5 K/min, detector temperature 350 C.

To identify fatty acids and triglycerides standards from Applied Sci. Lab. were applied. Mean values in groups determined by sex and age were compared with t-Student test [6].

Results

Analysed fat was clearly dominated by oleic and palmitic acids. For the whole population their values were 52.9 and 21.9 % respectively (Table 1). Two age groups did not differ in fatty acid composition, but differences were observed between sexes. Fat from male adipose tissue had a lower content of oleic acid and higher of myristic one than that from female adipose tissue.

Triglycerides were dominated by compounds with 52, 54 and 50 carbon atoms. For the whole population their mean values were 39.7, 24.6 and 21.8 % respectively (Table 2). Again, age did not affect the triglyceride composition of adipose tissue and differences were observed between sexes. For male group the share of triglycerides C_{46} and C_{50} was higher, that of triglyceride C_{54} - lower.

Table 1
Composition of fatty acids [%] in human adipose tissue depending on age and sex

Fatty acid	Age 41-60 yr (n=10)	Age 61-92 yr (n=22)	Male (n=18)	Female (n=14)	Whole population (n=32)
12	0.58 ± 0.32	0.42 ± 0.23	0.55 ± 0.26	0.39 ± 0.25	0.48 ± 0.26
14	3.10 ± 0.80	2.88 ± 0.73	3.24 ± 0.75*	2.65 ± 0.65*	2.98 ± 0.76
14:1	0.55 ± 0.16	0.46 ± 0.16	0.54 ± 0.18	0.44 ± 0.16	0.50 ± 0.17
15	0.40 ± 0.16	0.33 ± 0.22	0.39 ± 0.24	0.31 ± 0.12	0.36 ± 0.20
16	21.7 ± 1.21	21.9 ± 2.19	22.5 ± 2.19	21.3 ± 1.80	21.9 ± 2.00
16:1	5.84 ± 0.62	5.62 ± 1.08	5.79 ± 0.94	5.54 ± 1.00	5.66 ± 0.97
17	0.35 ± 0.09	0.30 ± 0.12	0.33 ± 0.13	0.32 ± 0.11	0.32 ± 0.12
17:1	0.43 ± 0.16	0.38 ± 0.12	0.41 ± 0.19	0.40 ± 0.23	0.39 ± 0.20
18	5.52 ± 0.89	5.25 ± 1.06	5.43 ± 0.67	5.28 ± 1.32	5.33 ± 0.99
18:1	52.4 ± 2.41	53.2 ± 3.59	52.1 ± 3.40**	54.2 ± 2.71**	52.9 ± 3.19
18:2	7.06 ± 2.07	7.14 ± 2.37	7.18 ± 2.45	6.82 ± 1.68	7.11 ± 2.21
18:3	0.42 ± 0.16	0.42 ± 0.24	0.39 ± 0.15	0.44 ± 0.28	0.42 ± 0.21
20:1	1.59 ± 0.41	1.74 ± 0.66	1.58 ± 0.44	1.93 ± 0.55	1.74 ± 0.49
S	32.2 ± 1.49	30.6 ± 2.68	31.7 ± 2.16	30.2 ± 2.61	31.0 ± 2.46
M	61.0 ± 1.94	61.8 ± 2.73	60.8 ± 2.47	62.5 ± 2.28	61.6 ± 2.54
P	6.87 ± 1.34	7.60 ± 2.28	7.46 ± 2.21	7.25 ± 1.85	7.38 ± 2.06
P/S	0.21 ± 0.04	0.25 ± 0.09	0.24 ± 0.04	0.24 ± 0.08	0.24 ± 0.08

S - total saturated fatty acids, M - total monounsaturated fatty acids, P - total polyunsaturated fatty acids
* - P<0.05, ** - P<0.01

Table 2
Composition of triglycerides [%] in human adipose tissue depending on age and sex

Triglycerides	Age 41-60 yr (n = 10)	Age 61-92 yr (n = 22)	Male (n = 18)	Female (n = 14)	Whole population (n = 32)
42	0.46 ± 0.38	0.35 ± 0.35	0.51 ± 0.45	0.34 ± 0.35	0.38 ± 0.36
44	1.08 ± 0.46	0.97 ± 0.50	1.22 ± 0.49	0.85 ± 0.52	1.00 ± 0.49
46	2.84 ± 0.86	2.40 ± 0.79	2.82 ± 0.71*	2.16 ± 0.77*	2.52 ± 0.83
48	8.47 ± 1.79	7.90 ± 1.72	8.65 ± 1.57	7.34 ± 1.69	8.06 ± 1.76
50	22.5 ± 2.86	21.5 ± 3.63	23.1 ± 3.35*	20.3 ± 2.79*	21.8 ± 3.47
52	40.8 ± 4.83	39.1 ± 3.21	39.7 ± 4.15	39.7 ± 3.17	39.7 ± 3.82
54	22.0 ± 5.79	25.9 ± 4.45	22.3 ± 5.54**	27.2 ± 3.26**	24.6 ± 5.09
56	1.88 ± 0.56	1.84 ± 0.68	1.73 ± 0.64	2.07 ± 0.64	1.88 ± 0.65

* < P 0.05, ** - P < 0.01

High content of oleic acid in the fat from human adipose tissue stated in this work is similar to the values observed in other countries. Among the inhabitants the following mean values of this acid were revealed: 49.9 [11], 49.7 [8] and 47.9 % [13] in the USA, 44 % [19] in Scotland, 44.5 % [15] and 47 % [12] in Sweden, 45.4 % [14] in South Africa, and 41-53 % [17] in Korea. Palmitic acid content in the quoted works as 18.8 - 26 %.

Compared with the results obtained in other countries a higher content of polyunsaturated acids was observed - in the USA 14.4 % [8], in Sweden 14.5 % [15] and 10.6 % [12], in Scotland 11.95 % [19]. Low share of polyunsaturated acids in the fat of adipose tissue of Poles and low value of P/S ratio result from a low content of polyunsaturated acids in food rations that are characteristic of our country. From the studies of Amarowicz et al. [1-3] it follows that food rations of various social groups in Poland contain 8.2-11.2 % of polyunsaturated fatty acids.

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