Free Fatty Acids in the Blood Serum of Psoriatics

N. B. ZLATKOV, J. T. TICHOLOV and A. L. DOURMISHEV

Institute of Dermatology and Venereology, Medical Academy, 1431 Sofia, Bulgaria

Zlatkov NB, Ticholov JT, Dourmishev AL. Free fatty acids in the blood serum of psoriatics. Acta Derm Venereol (Stockh) 1984; 64: 22–25.

Free fatty acids in the serum of 60 patients with generalized psoriasis were studied by a gas-chromatographic method. The same investigations in 40 healthy persons served for control purposes. It was established with statistical probability ($p<0.001$) that in the serum of psoriatics the levels of palmitic (C 16: 0), stearic (C 18: 0), arachidic (C 20: 0), and docosadienic (C 20: 2) acids were increased, while the levels of the linoleic (C 18: 2) and arachidonic (C 20: 4) acids were depressed. There is no behenic acid (C 22: 0) in the blood serum of psoriatics. Thalassotherapy caused no significant changes in the levels of these free fatty acids in psoriatics. *Key words: Psoriasis; Free fatty acids; Thalassotherapy.*
(Received January 24, 1983.)

N. B. Z. Zlatkov, Institute of Dermatology and Venereology, Medical Academy, 1431 Sofia, Bulgaria.

The free fatty acids (FFA) are part of the structure of the lipids and provide 50–90% of the necessary energy for the mammalian organism (5). The rate of their metabolism is extremely high, even if their content in the blood serum is very low, and they make up only 1–3% of the total concentration of the lipids in the serum (6). Some of the FFA, such as linoleic and arachidonic acids, are part of the structure of phospholipids of cell membranes, while others appear as precursors of prostaglandins. The arachidonic acid formed in the liver is such a precursor; it is deposited in the skin via the plasma lipoproteins (3).

There are several published reports dealing with investigations of FFA in the serum of psoriatics (2, 9). Sugihara & Okido (9) have examined the contents of FFA in prebetalipoproteins in 10 persons with psoriasis. In comparison with the control group of healthy persons, no significant difference was established. Brenner et al. (2) found an increase of palmitoleic and myristic acids and decrease of linoleic acid in the sera of 13 people with psoriasis.

The purpose of the present study was to compare the serum level of FFA in psoriatics with those in a control group and to find out whether thalassotherapy for psoriatics would influence the serum level of FFA.

MATERIALS AND METHODS

60 people suffering from psoriasis (generalized form), 20 women and 40 men, 20–50 years old, were investigated. They were not on a special diet and no medicaments, general or local, were given them while thalassotherapy was carried out on the Black Sea coast (Slanchev briag) in the summer months (June, July and August). The total dose of radiation was 4.26×10^3 J per day, which means that over 28 days every patient had received 1.93×10^5 J altogether. During the thalassotherapy, complete abstinence from alcohol was imposed. Blood tests for FFA were performed in all patients before and after the thalassotherapy.

The control group consisted of 40 healthy persons (20 men and 20 women), 20–50 years old.

The analysis of FFA in whole blood serum was made with a gas-chromatograph (Perkin Elmer, model 900) according to Stantscheff's method (8). Isothermic $t°$ 428.2 K, inj. and detec. 543.2 K and and 567.2 K. Liquid phase 10% DEGS (Schuchardt) on Celite AW, 80–100 meshes (Maybux Products Ltd.). The results are analysed statistically according to the method of variation analysis.

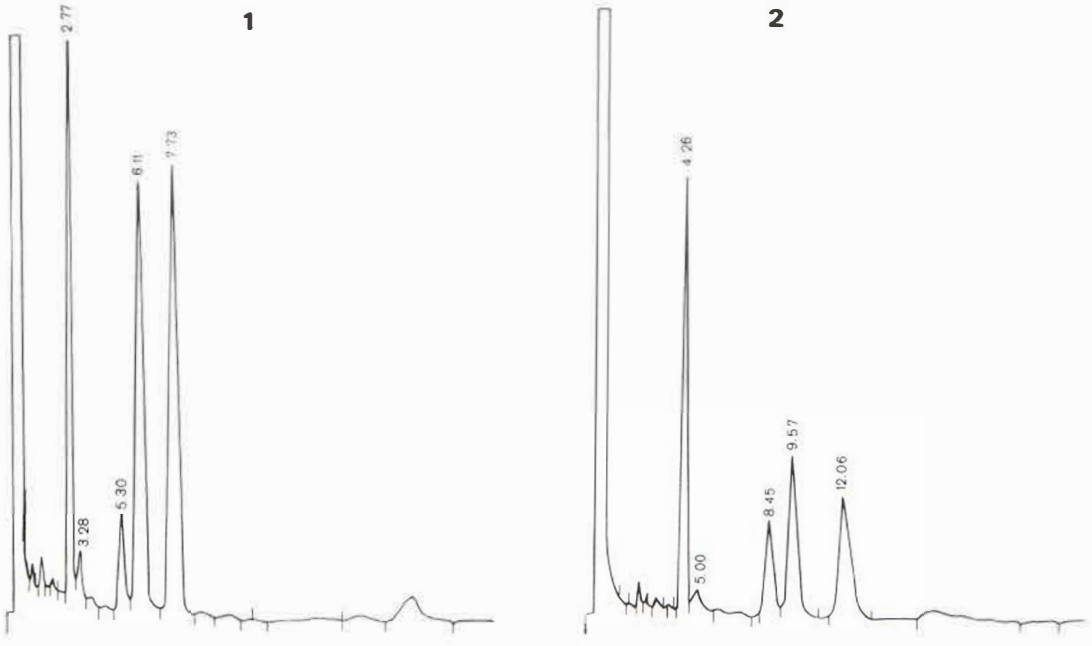

Fig. 1. Free fatty acids in the blood serum of a healthy person.

Fig. 2. Free fatty acids in the blood serum of a patients with psoriasis.

RESULTS

The results are shown in Table I and Figs. 1 and 2. Statistically significant increases ($p<0.001$) in palmitic, stearic and docosadienic acids were established in persons suffering from psoriasis, compared with the control group. The low level of linoleic and arachidonic acids in the blood sera of psoriatics was also statistically significant. No behenic acid was discovered in the sera of psoriatics.

Table I. *Free fatty acids in the serum of patients with psoriasis vulgaris*

Cn	Name	Control group (healthy persons) % (n=40)	Patients with psoriasis % (n=60)	
C 14 : 0	Myristic acid	1.20±1.54	1.11±0.68	>0.05
C 14 : 1	Myristoleic acid	0.24±0.43	0.47±0.38	<0.01
C 15 : 0	Pentadecanoic acid	0.25±0.28	0.36±0.25	<0.05
C 16 : 0	Palmitic acid	18.53±3.38	21.72±4.89	<0.001
C 16 : 1	Palmitoleic acid	3.64±1.69	3.27±1.03	>0.05
C 17 : 0	Heptadecanoic acid	0.17±0.07	0.55±1.01	<0.05
F	Phytic acid	0.44±0.36	0.41±0.62	<0.01
C 18 : 0	Stearic acid	8.93±5.71	14.41±7.79	<0.001
C 18 : 1	Elaidic acid	23.36±2.96	22.94±4.43	>0.05
C 18 : 2	Linoleic acid	35.36±6.20	27.67±7.75	<0.001
C 18 : 3	Linolenic acid	0.64±0.86	0.43±1.94	>0.05
C 20 : 0	Arachidic acid	0.10±0.12	0.93±1.50	<0.001
C 20 : 2	Docosadienic acid	0.16±0.29	1.08±1.44	<0.001
C 20 : 3	Docosatrienic acid	0.38±0.33	0.40±0.37	>0.05
C 20 : 4	Arachidonic acid	4.24±2.14	2.54±2.23	<0.001
C 20 : 5	Docosapentaenic acid	0.35±1.48	0.62±2.45	<0.001
C 22 : 0	Behenic acid	0.13±0.47	0.00	<0.001

FFA with an even number of double bonds in psoriatics show a statistically significant decrease, compared with the control group. FFA with an odd number of carbon atoms, as well as the non-branching and saturated FFA, show a statistically significant increase in the psoriatics patients. The sum of the non-saturated FFA in psoriatics in no different from that of the control group.

After thalassotherapy the level of FFA in the patients' sera does not indicate any tendency to normalize, in spite of the clinical improvement of the psoriatic lesions on the skin (Table II).

DISCUSSION

The human epidermis is an active site for lipid biosynthesis. Palmitic and stearic acids are believed to be utilized by the cells of the basal and prickle cell layers of the epidermis in the process of keratinization. The fatty acids with branched chains and a chain longer than C 20 are incorporated into the structure of lipids in the cell of stratum corneum, where they ensure the stability of the cell membrane (1).

Unlike the normal skin, where the components of C 16 fatty acids (mostly palmitic) predominate, in the lipids of the psoriatic squamae, mainly C 18 fatty acids (stearic, oleic, linoleic, linolenic, etc.) are represented (11). The FFA content is greater in the stratum corneum of the psoriatic lesions than in healthy skin (1).

In the blood serum of psoriatics a certain decrease in the level of non-esterified fatty acids is observed, which correlates to their increase in the skin and the parakeratotic squamae. Presumably the intense epidermopoiesis in psoriatics is accompanied by an increased need of energy and since the local sources for synthesis of fatty acids are restricted, the necessary fatty acids come from the blood. Moreover, the accumulation of non-esterified fatty acids in the skin of psoriatics could be considered a particular form of distribution and esterification (4). Cantieri et al. (3) attribute the accumulation of fatty acids in psoriatic squamae to increased activity of the guanyl cyclase and enhanced production of cyclic GMP.

In our present investigation a statistically significant increase in palmitic, stearic and arachidic acids as well as a depressed level of linolic and arachidonic acids was established, compared with the control group. A similar decrease in linoleic acid has been established by Brenner et al. (2) in their investigations of a small group of psoriatics. On the other hand Sugihara & Okido (9) in Japan did not find any changes in the level of FFA, compared with the control group. In Caucasians, psoriasis is associated predominantly with HLA-B 13 and HLA-B 17, while in Japanese the association is mainly with HLA-B 1

Table II. *Free fatty acids in the serum of patients with psoriasis vulgaris after thalassotherapy*

Cn	Name	Patients with psoriasis before thalassotherapy % (n=60)	Patients with psoriasis after thalassotherapy % (n=60)	p
C 16:0	Palmitic acid	21.72±4.89	22.41±4.40	>0.05
C 18:0	Stearic acid	14.41±7.79	15.02±9.14	>0.05
C 18:2	Linoleic acid	27.67±7.75	26.78±7.37	>0.05
C 20:0	Arachidic acid	0.93±1.50	1.22±1.83	>0.05
C 20:2	Docosadienic acid	1.08±1.44	0.73±1.42	>0.05
C 20:4	Arachidonic acid	2.54±2.23	2.74±1.81	>0.05

and HLA-B 37. Probably some racial and genetic differences exist with regard not only to psoriasis but to disturbed lipid metabolism as well.

A similar combination of increased palmitic and stearic acids with decreased linoleic and arachidonic acids has been observed in persons with liver steatosis (10). Histological investigation of the livers of psoriatics has indicated the existence of steatosis in 64% of patients vis-à-vis 24% in the control group (12). The analysis of the liver enzymes in psoriatics revealed an enzyme constellation characteristic of liver steatosis–hypercholinesterasemy with normal indicator and excretory enzymes (7).

The changes in the concentrations of some FFA could have a pathogenic role in psoriasis. These changes continue for a long time and are not influenced by an active thalassotherapy, unlike the skin lesions, which are much improved.

REFERENCES

1. Ansari M, Nikolaides N. Fatty acid composition of the skin. Lipids 1970; 5: 838–842.
2. Brenner S, Krakowski A, Levtov ●, Heldenberg P, Werbin B, Tamir I. Serum lipids in patients with psoriasis. Dermatologica 1975; 150: 96–102.
3. Cantieri LS, Graff G, Goldberg ND. Cyclic GMP metabolism in psoriasis: Activation of soluble epidermis guanyl cyclase by arachidonic acid and 12-hydroxy-5,8,10,14-eicosotetraenic acid. J Invest Dermatol 1980; 74: 234–237.
4. Dovzhansky SI, Grashkina IG, Suvorov AP. Relationship between certain values of lipid metabolism in the skin and the blood in psoriasis. Vestn Dermatol (Moskva) 1974; 2: 15–18.
5. Fredrickson DS, Levy RJ, Lees RS. Fat transport in lipoproteins: an integrated approach to mechanism and disorders. N Engl J Med 1967; 276: 278–282.
6. Haller H, Hanfeld M, Jaross W. Lipidstoffwechselstörungen. Fischer, Jena 1975.
7. Petkov I, Zlatkov N, Dimov D. A study of some enzymes in patients with psoriasis. Dermatol Venerol (Sofia) 1974; 13: 230–234.
8. Stantscheff P. A new analytical system for multicomponent gas-chromatographic analysis of metabolites in biological material. Fresenius Z Anal Chem 1978; 292: 39–42.
9. Sugihara I, Okido M. Fatty acid composition of very low density lipoprotein in psoriatic serum. Jpn J Dermatol 1972; 82: 107–108.
10. Varbanov G, Mihova V. Deviations of the free fatty acids levels in patients with chronic liver disease. Savr Med (Sofia) 1980; 31: 26–28.
11. Wilkinson DL, Farber, EM. Fatty acid of surface lipids from uninvolved skin in psoriasis. J Invest Dermatol 1967; 49: 526–532.
12. Zachariae H, Søgaard H. Liver biopsy in psoriasis. Dermatologica 1973; 146: 149–155.