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COMBINED TREATMENT OF PUSTULOUS SKIN DISEASES WITH
ULTRA-HIGH FREQUENCY ELECTRICAL FIELD
AND STAPHYLOCOCCAL ANTIPHAGIN ELECTROPHORESIS

by G. S. Antonov

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COMBINED TREATMENT OF PUSTULOUS SKIN DISEASES WITH ULTRA-HIGH FREQUENCY ELECTRICAL FIELD AND STAPHYLOCOCCAL ANTI-PHAGIN ELECTROPHORESIS

Following is a translation of an article by G. S. Antonov, Candidate in Medical Sciences, Head of the Department of Balneo-physiotherapy, Hospital imeni V. I. Lenin, Leningrad, in the Russian-language periodical Voprosy Kurortologii, Fizioterapii, i Lechebnoy Fizicheskoy Kul'tury (Problems in Health Resort Science, Physiotherapy and Medical Physical Culture), No 6, Moscow, Nov/Dec 1964, pages 513-518.

In recent years various methods of physiotherapy have been widely applied in the treatment of inflammatory diseases.

In patients with inflammatory diseases of the skin and subcutaneous tissue (furuncles, carbuncles, hydradenitis), in addition to local signs of inflammation (swelling, redness, fever and pain), a number of general reactions develop which are manifested in changes in hemodynamics, the activity of phagocytosis and other indications of a state of immunity, which play an especially important role in inflammatory diseases. A number of authors (L. A. Solov'yeva; N. G. Vil'dermut and others) have shown that in the period of pronounced inflammatory reaction in patients with furuncles, the phagocytotic activity of the blood and the titer of the complement drop. //

Therefore, in selecting the physical factor for treatment of patients with inflammatory processes in the soft tissues, it is necessary to select methods which not only have an effect on the processes taking place in the pathological focus (delay the development of bacteria, increase resorption, decrease exudation and pain, etc.) but which can

also increase phagocytosis and other immunobiological reactions, stimulate proliferation of connective tissue elements, and liquidate diseases which increase the sensitivity of the organism to staphylococcal infection.

This sort of pathogenetic treatment of patients with pustulous skin diseases, it seems to us, can be carried out by the combined effect of the ultra high frequency (UHF) electrical field and application of staphylococcal anti-phagin electrophoresis.

It is known that the UHF electrical field is very effective in purulent inflammatory diseases (G. L. Frenkel'; Ye. P. Volkova; I. I. Zal'tsberg and L. A. Sotskiy; Liebesny; Schliephake and others). Under the effect of a UHF electrical field the vessels dilate (primarily the deep capillaries), blood circulation and draining of the lymph from the zone of the focus of inflammation are intensified, the phenomena of dehydration occur, pain decreases, and fixation of calcium in the tissues takes place (Pflomm) which also results in a decrease of exudation; proliferation of connective tissue elements is also intensified (I. A. Piontkovskiy and R. K. Yanoshevskaya; V. A. Militsyn et al). There are indications of bacteriostatic effects of a UHF electrical field and of its activating effect on the reticulo-endothelial system (A. V. Rakhmanov) and immunobiological processes (A. V. Ponomarev and O. I. Kambarova; T. M. Slavskiy and others). In particular, phagocytotic activity of the blood is increased (F. M. Suponitskaya; N. G. Vil'dermut; Jorns).

According to our data, staphylococcal anti-phagin electrophoresis in patients with pustulous skin diseases also has a resorptive, anti-inflammatory and analgesic effect; it causes an increase in the opsono-phagocytotic indices of the blood, reduces the period of therapy and decreases the number of recurrences (G. S. Antonov).

In view of the peculiarity of the effect of the UHF electrical field and anti-phagin electrophoresis on the course of the inflammatory process and the phenomenon of immunogenesis, we assumed that combined application of these would have a still better effect, would increase the strength of immunity and decrease the number of relapses. To check this assumption we conducted experimental investigations on rabbits and made clinical observations of patients with furuncles and furunculosis.¹

Method. Experiments were carried out on 12 rabbits, 10 of which were intracutaneously injected on the lateral surfaces of the trunk, which had been sheared with scissors, (2 areas), with 500 million microbe bodies (0.5 ml of staphylococcal emulsion); 2 rabbits were left for controls (for calculation of the opsonic index).

B2
B16
B28(?)
B29(?)
B30

56

H14

H2

?check

?check?

On the 5th day at the place where the staphylococcal emulsion was injected inflammatory infiltrates appeared. To discover the character of the development of inflammation during treatment, on the 6th day we injected intracutaneously another 400 million microbe bodies. On the following day 8 rabbits started treatment in 4 different combinations and 2 rabbits were left without therapy, for controls.

Two rabbits were treated with a UHF electrical field by means of a portable generator with a wave length of 6 m; electrodes were placed on opposite sides on the lateral surfaces of the trunk with a gap of 0.5-1 cm. Oligothermal doses were applied. In order to guarantee constancy of the experimental conditions, in the circuit of one of the electrodes we connected in series a thermal amperemeter, whose readings we tried to keep in the neighborhood of 0.5 amp. The treatments were given daily for 10 minutes. } UHF?

In staphylococcal anti-phagin electrophoresis (2 rabbits), one electrode 20 sq cm in area with a coating moistened with undiluted anti-phagin was put on the area of pustules and connected with the negative pole of a galvanic apparatus; the other electrode, with a coating moistened by tap water was put on the opposite side (transversely) and connected with the positive pole; current intensity was 15 microamperes. The treatments were given every day for 30 minutes.

In treatment with the combined effect of the UHF electrical field and anti-phagin electrophoresis (2 rabbits) and the same effect, taken in reverse order (2 rabbits), the methods described above were used with 10-15 minute intervals between the two procedures.

All the rabbits were treated for 8 days. Two infected rabbits were not treated (controls).

For all rabbits phagocytotic activity of the blood was determined. For this, blood was taken 17 times from the veins of the ear; up to infection -- 3 times in the course of 8 days (in order to discover possible variation of phagocytosis in healthy rabbits); after the first and supplementary inoculations, then after every treatment, and finally, after 2 and 8 days, as well as after 5 and 10 weeks after completion of the therapy.

In all 204 blood smears were prepared. In the smears the phagocytotic number was determined, i.e., the average number of bacteria held by 100 leucocytes (neutrophils), and the "opsonic index" (i.e., the ratio of the phagocytotic number of the investigated infected rabbit to the phagocytotic number of a healthy rabbit); this reflects the immune

H 2
H 13
"define index"

Q4

properties of the blood serum.

The results of the experiments showed that rabbits treated by anti-phagin electrophoresis and the combined effect of a UHF electrical field and anti-phagin electrophoresis recovered in 5 days, whereas those treated by a UHF field recovered in 7 days and those without therapy recovered only in 9 days.

In looking for the development of pustules on the place of supplementary infection (this was done 24 hours before beginning therapy), we found that in control rabbits on the 4th day after infection infiltrates with a diameter up to 1 sq cm were formed with acute hyperemia and moderate edema. In all treated rabbits the infiltrates developed considerably less; their diameter did not exceed 0.6 sq cm, hyperemia was slight and no edema appeared. The favorable effect of the UHF electrical field on the course of experimental pustules (resorption up to formation of purulent disintegration) has been shown by Ye. Gorkin and K. Suchkova. In our experiments these infiltrates with the effect of the UHF electrical field were resorbed on the 6th day, and with anti-phagin electrophoresis and the combination of this with the UHF electrical field they were resorbed even on the 4th day; this once more confirms the usefulness of early physiotherapy in patients with pustulous skin diseases.

The data we obtained are represented in Fig. 1 in the form of comparative curves. These data indicate a certain

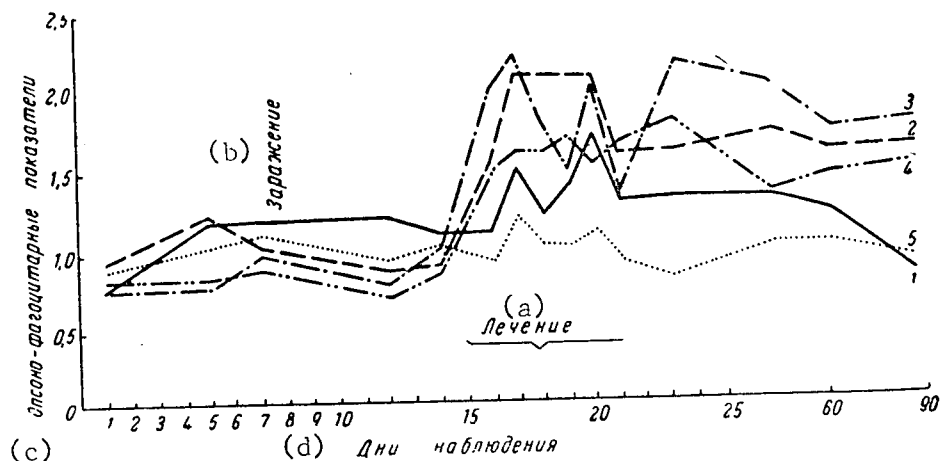


Figure 1. Changes in Opsono-phagocytotic Indices of the Blood in Experimental Animals.

Key: 1) UHF electrical field; 2) anti-phagin electrophoresis; 3) UHF electrical field and anti-phagin electrophoresis;

- 4) anti-phagin electrophoresis and UHF electrical field;
- 5) without treatment (control); a) treatment; b) infection;
- c) opsono-phagocytotic indices; d) days of observation.

advantage of combined treatment by the UHF electrical field and staphylococcal anti-phagin electrophoresis. With this combination, phagocytosis grew noticeably during the days of treatment and after treatment was completed, it maintained itself at a higher level than the initial figures. At the same time, with the effect of the UHF electrical field alone, the build-up was smaller and it lasted only during the days of therapy.

For healthy rabbits during the whole time of investigation (90 days), phagocytotic numbers varied within the normal limits.

The data obtained were checked in the clinic. For this purpose we observed 103 patients with furuncles and furunculosis (70 men and 33 women), of which 72 were aged 16 to 30 years. The patients usually came in on the 4th day after the beginning of development of furuncles with localization in the region of the face (32 persons), neck (19), trunk (30) and limbs (22). Forty-six persons suffered from recurrent forms of furunculosis; 24 patients had accompanying diseases simultaneously with furuncles -- chronic polyarthritis, stomach ulcers, anacid and hypoacid gastritis, tuberculosis of the lungs in the stage of induration, chronic inflammatory processes in the branches of the uterus, ascariasis, etc.

The UHF electrical field was applied to 25 patients, staphylococcal anti-phagin electrophoresis to 26, the UHF electrical field and anti-phagin electrophoresis to 26, and the same combination in reverse order to 26. For all patients the picture of the disease was approximately the same.

The effectiveness of therapy was estimated according to the course of the inflammatory process during treatment, and for 59 patients we also investigated shifts in the white portion of the blood and its phagocytotic activity before and after therapy.

Method of treatment. We used a UHF apparatus with a wave length of 6 m. One electrode was placed in the region of the focus of inflammation with a gap of 1 cm. The other was placed in the zone of the regional lymphatic nodes. The treatments were given every day for 15 minutes. For staphylococcal anti-phagin electrophoresis we took 2 layers of sterile gauze 100-150 sq cm in area, moistened with undiluted anti-phagin, and applied them to the center of inflammation; over this we placed a hydrophilic coating

moistened with warm distilled water, and an electrode connected to the negative pole of the galvanic apparatus. The other electrode with a coating moistened with tap water was placed on the opposite side (transversely) and connected to the positive pole. Current intensity was 10-20 microamperes. The treatments were given daily for 30 minutes. In combined treatment the interval between the procedures was 5-10 minutes.

The results of treatment are given in Table 1.

(a) Вид лечения	(b) Число больных	Течение процесса (c)					(j) Средняя продолжительность (в днях)		(k) Среднее число процедур
		(e) рассасывание (без образования гнояника)	(f) развитие гнояника	(d) вскрытие гнояника			(h) со дня забора леванья	(i) с начала ле- чения	
				(g) вскрытие гнояника					
				после 1 про- цедуры	после 2 про- цедур	после 3 про- цедур			
(l) Электрическое поле УВЧ	25	2	23	2	16	5	9,1	5,8	6
Электрофорез антифа- гина (m)	26	6	20	12	6	2	9,0	5,4	5-6
Электрическое поле (n) УВЧ и электрофорез ан- тифагина	26	3	23	13	9	1	9,1	5,2	5
То же, в обратной по- следовательности (o)	26	5	21	16	4	1	9,0	5,0	5

Table 1. Results of Treatment of Patients with Furuncles. Key: a) form of therapy; b) number of patients; c) course of process; d) opening of pustules; e) resorption (without formation of pustules); f) development of pustules; g) after 1 treatment; h) from the day of infection; i) from the beginning of treatment; j) average duration (in days); k) average no. of treatments; l) UHF electrical field; m) anti-phagin electrophoresis; n) UHF electrical field and anti-phagin electrophoresis; o) the same, in reverse order.

Comparing the data on individual methods of therapy, it is possible to see that resorption of the inflammatory infiltrate (without cutting the pustule open) and opening the pustule by tearing away necrotic tissues took place more frequently and faster with anti-phagin electrophoresis and the latter in combination with the UHF electrical field.

The average duration of treatment (in days) for these patients was also somewhat less than for the others.²

Comparing phagocytotic indices for patients given different therapy (Table 2 and Figure 2), it is possible to see that with the application of the UHF electrical field the increase in these indices took place in a smaller number of patients and their build-up was less pronounced and lasted only during the period of therapy. This phenomenon is apparently explained by the immunizing effect of dying microbe bodies and the products of their disintegration formed in the period of effect of the UHF electrical field.

The most pronounced increase in phagocytotic indices was noted with anti-phagin electrophoresis, applied separately and in combination with the UHF electrical field. In patients receiving only anti-phagin electrophoresis the phagocytotic indices for 2 weeks after therapy gradually declined, almost to the initial level, but with a second course of treatments³ they again increased considerably.

With combined treatment the phagocytotic indices continued to grow even after therapy; they grew even after the second course of treatments.⁴ In this connection it is possible to assume that tissue exposed to the UHF electrical field retains the anti-phagin, which has a prolonged effect in small doses on the processes and on immunogenesis; in combination with the UHF electrical field it causes more pronounced responses of the organism than either of these treatments done separately.

Вид лечения (a)	(b) Число больных	Фагоцитарные показатели после лечения (d)					
		(c) уменьшились	(e) не изменились	увеличились (g)			
				(f) слабо	в 2 раза	в 3 раза	больше, чем в 3 ра за (h)
Электрическое поле УВЧ (i)	14	2	3	6	3	—	—
Электрофорез антифагина (j)	15	2	2	4	4	3	—
Электрическое поле УВЧ и электрофорез антифагина (k)	15	3	2	3	6	1	—
То же, в обратной последовательности (l)	15	3	1	2	6	2	1

Table 2. Phagocytotic Indices in Furunculosis Patients.

Key: a) form of therapy; b) number of patients; c) decreased; d) phagocytotic indices after therapy; e) no change; f) slight change; g) increase; h) doubled; i) tripled; j) more than tripled; k) UHF electrical field; l) anti-phagin electrophoresis; m) UHF electrical field and anti-phagin electrophoresis; n) the same, in reverse order.

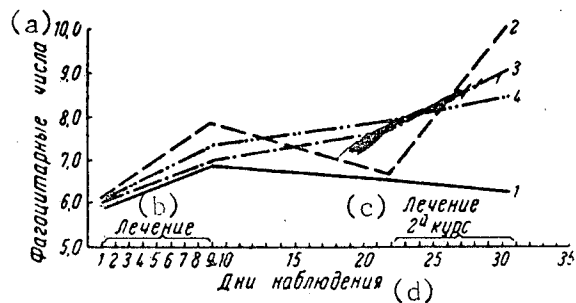


Figure 2. Curves of Phagocytotic Activity of the Blood for Patients with Furunculosis with Various Methods of Therapy. Key: 1) UHF electrical field; 2) anti-phagin electrophoresis; 3) UHF electrical field and anti-phagin electrophoresis; 4) same, in reverse order; a) phagocytotic number; b) therapy; c) second course of treatments; d) days of observation.

The magnitude of change of the phagocytotic activity of the blood in patients with furunculosis depended on its initial magnitudes, and also on the presence of other diseases in the patient. If the phagocytotic activity of the blood before therapy was low, a larger increase of phagocytosis occurred in the absence of other diseases than in patients who before therapy had normal or elevated phagocytosis. The phagocytotic activity of the blood by the end of therapy for part of the patients, mainly for those with recurrent forms of furunculosis and simultaneously suffering from other diseases (chronic polyarthrititis, stomach ulcers, etc.) did not change or decreased with all forms of therapy.

As for the white portion of the blood, the most pronounced favorable shifts were noted after treatment by anti-phagin electrophoresis, especially in combination with the UHF electrical field. We observed normalization of the number of leucocytes in patients with leucocytosis, pronounced lymphocytosis for patients with lymphopenia, and a normal number of lymphocytes, moderately pronounced eosinophilia and monocytosis. With other methods of therapy, especially with the effect of the UHF electrical field, favorable changes in the white portion of the blood were not noted.

As a rule, we noted a parallelism between the clinical outcome, phagocytotic activity and the hemogram: phagocytosis was increased, the hemogram was improved, and recovery occurred faster. If the patients with furunculosis were simultaneously suffering from other diseases, then the

H10
H2

period of treatment was extended to 9 days; phagocytotic activity by the end of treatment was not changed or had increased very slightly (to 10%); evident improvements with the hemograms were not noted. Thus, the results of clinical observations on patients with furuncles and furunculosis to a certain extent coincided with the data from our experimental research.

Further results of therapy were obtained for 44 persons. Recurrences of the disease in the first 3 months after completion of therapy were noted in 13 patients, who received only the UHF electrical field. This is explained by the fact that with the UHF therapy immunity is weaker than with this in combination with anti-phagin electrophoresis.

Conclusions

1. Experimental and clinical observations showed that the most pronounced curative effect occurs for patients with pustulous skin diseases with the combined effect of staphylococcal anti-phagin electrophoresis and the UHF electrical field.

2. For increasing the intensity of immunity, and consequently, decreasing the number of recurrences in patients with recurrent forms of furunculosis, it is useful to carry out two courses of combined treatment with 2-3 week intervals between them.

3. The curative effect depends not only on the method of therapy but also on the state of the patient, the presence of accompanying diseases and other causes which determine the immunological reaction. In this connection, for therapy of patients with furunculosis we recommend differential use of physical medical means.

Footnotes

1. Experimental investigations and part of the clinical observations were carried out in the Leningrad Institute of Physiotherapy and Health Resort Science in 1953-1955.

2. The beginning of recovery (healing) we considered to be the day of formation of the epithelium at the place of open sores.

3. The second course of treatments was given to 11 patients: 2 because of recurrence of furunculosis and 9 for preventive purposes.

4. Repeated treatment was carried out for preventive purposes on 10 persons.

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