

EXTREMELY HIGH FREQUENCY (EHF) THERAPY

[Complementary Medicine International, 1996, 3 (1): 29-35]

Mikhail Teppone, Larisa Novikova, Sergey Grigoriev, Romen Avakian

Abstract.

Extremely High Frequency (EHF) Therapy is a new method of treatment which is based on different biological effects of low intensive electromagnetic radiation of millimeter band. Various aspects of this new therapeutic modality are described. Authors divide EHF-therapy into three independent branches: Microwave Resonance Therapy (MRT), Extremely High Frequency (EHF) Puncture, and Extremely High Frequency (EHF) Therapy. Indications, counter indications and side effects have been presented.

EHF-Therapy as a new method of treatment

Extremely High Frequency (EHF)-therapy, or MM-therapy, is a new method of treatment, based on the different biological effects of low power level of electromagnetic radiation (EMR) in the millimeter (MM) band [1-8].

This method of treatment had proved its high efficacy in treating various diseases, including peptic ulcer, gastric polyps, bronchial asthma, high blood pressure, infantile cerebral paralysis, diabetic angioneuropathies, chronic alcoholism, Perthes disease, and others. It can be used alone or as adjunct to medicinal, X-ray, and physiotherapy, before and after surgery [1-8].

The first investigations on the biological effects of MM-EMR began in the USSR in the middle of the 1960s. Since that time, EHF-therapy has moved from theoretical and experimental works to the clinical application. Throughout the former Soviet Union, regular EHF-therapy seminars and conferences are organized; books and journals on the topic are published; and doctors are taught the therapy at special courses.

Physical aspects of EHF-radiation

Millimeter radio waves are considered Extremely High Frequency (EHF). On the EMR spectrum, EHF resides between centimeter radio waves and infrared waves and includes frequencies from 30 to 300 GHz or wavelengths from 120.0 to 1.0 mm. However, the literature on EHF-therapy only reports results obtained during application of 30.0 - 120.0 GHz radiation only. The usual consideration is that the most significant biological effects have been obtained at the frequencies which corresponded with the oscillations of oxygen and water molecules [10-12].

EHF application is of coherent radiation when all waves have the same frequency and phase. Noise exists when there is an axis frequency and included zones of radiation on the either side of this central frequency

Generally, the applied power of this radiation does not exceed 1.0-10.0 mW.

The depth of the MM EMR penetration into the living tissue and skin is not more than 0.2-0.5 millimeters.

Hypotheses which explain EHF biological and therapeutic effects

Theory of N.Deviatkov, Academician of Russian Academy of Sciences, and Professor M.Golant: Homeostasis is connected with an organism's cell field generation in the EHF band. The amplitude-frequency responses of radiation from healthy and unhealthy organisms are different as pathology differs from healthy cells. Outside EHF-radiation (from the EHF-producing apparatus) imitates EHF self-radiation of the organism. Through the treatment process, the organism fulfills the functions of the synchronizing apparatus and restores the healthy rhythm, lost when during illness. Initial events take place in cell membranes, where the acoustic-electrical waves are formed. Temporary structure elements appear which exit when the cells restore their normal functions. Information transfer to the whole organism is accomplished through the intercellular interaction and the nervous system. Thus EHF-therapy functions to mobilize organism reserves [13-14].

Theory of Professors O.Betskii, I.Petrov and Yu.Khurgin.

The initial molecular target of the EHF-radiation are water molecules within the organism. The interaction between water molecules and macro-molecules (e.g., albumin) leads to the appearance of the functionally active configuration of the macro-molecules. The therapy generates physical and chemical processes added to the general metabolic system, and normalizes vitally important cell functions. Secondary effects may include changing the activity of the ATP synthesis of different regulation systems. The final biological and therapeutic effects depend on the reactions of the neural, endocrine, immune, cardiovascular, and other systems of the macro-organism [15-16].

Home

Articles

> EHF-1996

Contact Us

Theory of Professor S. Sit'ko.

Professor Sit'ko believes that every living organism has its own "characteristic frequency." A sick organ or organism interacts with these "resonance" frequencies to restore its homeostasis. EMR can spread through the living organism by means of "channel-point" system known from Chinese acupuncture [8,10,17].

Biological effects observed during EHF-therapy.

Analysis of the literature dealing with the EHF makes it possible to specify several types of the effects appearing during EHF-influence:

Specific effects associated with the frequency of MM-EMR.

All aforementioned hypotheses point to the "resonance" nature of the interaction between artificial MM EMR and bio-objects. Various experiments have supported this theory. EHF-radiation can result in the accelerations of the active transport of ions Na⁺; in the variation of the membrane penetrability of erythrocytes for K⁺ ions; and in the acceleration of the peroxide oxidation of the un-saturated fatty acid in liposmata, etc. The frequency dependence of the biological effects was a peculiar experimental fact revealed at millimeter wave radiation of various macro-molecules and micro-organisms. Later investigations revealed "resonance" hemoprotective effect of EHF-influence before application of the lethal dose of X-ray or chemotherapy medicines. Therapeutic application of MM-EMR leads to suggest that the human body has its own "characteristic" or "resonance" frequencies [10, 17-20].

Non-specific effects associated with the irradiated zone.

Other researchers have concluded that the irradiated zone did not play any role if "resonance" frequency was used [21]. However, contrary results were observed in other experiments. If the right side of the rats were irradiated, mineral-corticoid effects were achieved. However, if the left side received the treatment, gluco-corticoid effects were realized [22]. If the location of the irradiated zone was changed, it was also necessary to change the frequency of MM-EMR to achieve hemoprotective effect [19, 20]. During EHF-influence upon bio-systems of different complexity, it was shown that different signals spreading from the irradiated place bore the certain information about place of irritation only [23]. Clinical experiments revealed necessity to individualize the irradiated zone-acupoints [21].

Non-specific effects conditioned by developing the [General Adaptation Syndrome](#) (GAS).

In accordance with the theory of the GAS by H. Selye, if any new factor influences upon a bio-object, the organism initiates the GAS to protect itself from this factor and prevent it from dying. At the same time, the organism builds up a specific adaptation syndrome to the new factor and GAS subsides [25]. Naturally occurring EMR of MM band is absorbed by the atmosphere almost completely and does not reach the surface of the Earth. Therefore organisms have not experienced the effects of such waves [10-12]. Therefore, MM-EMR is indeed a "new" factor for every living organism. Comparing neuroendocrine mechanisms of GAS (energetic, structural and immune aspects of the resistance) [26, 27] with the results of experimental and clinical works on EHF-influence [28-30] it becomes apparent that during EHF-therapy, GAS is frequently initiated.

Versions of EHF-therapy.

Three types of the biological effects appeared during EHF-influence to determine three versions of EHF-therapy:

- 1) EHF-therapy with individual frequency of MM-EMR,
- 2) EHF-therapy with individual irradiated zones,
- 3) EHF-therapy without individualization frequencies as well as irradiated zones.

EHF-therapy with individual frequency of MM EMR or Microwave Resonance Therapy (MRT).

The hypothesis about an organism's own "characteristic frequencies" was the basis of this version of EHF-therapy. During the first procedure of the treatment, a doctor influenced a patient's acupoint by means of MM-EMR. Frequencies of the radiation were then adjusted and the sensory reactions of the patient observed. Usually patients had sensations of warmth or coolness, or a feeling of waves or something creeping. Some felt these sensations localized to a certain region; others felt the sensation moving along the extremities or trunk. Some of the patients had exhibited changes in their emotional condition. The comfortable sensations appearing at the place the "sick organ" served as a criterion for individualization of the therapeutic frequency. During the sensory reactions, the changes of the functional activity of different organs were observed by means of electrocardiograph, electro-encephalograph, electrogastrograph, and heat monitor, etc. [10, 31-33].

EHF-therapy with individual irradiated zone or EHF-puncture.

Some treatments have utilized the application of MRT or EHF-therapy with individual frequency [34]. To investigate the phenomenon of sensory reactions during EHF-therapy, the temperature at the skin projections of acupoints was monitored and it was revealed that sensory reactions were accompanied by changes of the temperature at the affected acupoints. Subsequent researches showed sensory reactions occurring during MRT were the same as the phenomenon of "Arrival of Qi," known from Traditional Chinese Medicine (TCM) [35].

Adequate evidence exists to show it is the zone-acupoints to which the radiation was applied during EHF-therapy which enhances the treatment was not the MM-EMR frequency [23, 24, 36]. The frequency determined the likelihood of MM-EMR being absorbed by the water-containing structures of the skin, i.e. the absorption and reflection, and hence, the intensity of irritation of the stimulated zone [15, 37]. The end nonspecific effects of EHF-therapy were realized through the participation of various regulator systems of macro-organism.

If acupoints had been hypersensitive to MM-EMR, it was apparently due to the high tissue hydration of acupoints [10, 38]. Individualization of acupoints was the most effective according to the principles of Traditional Chinese Medicine [39-40]. The diagnosis, arrived at through TCM, determined selection of acupoints, duration of the EHF-influence, and length of the procedures.

The combination of different biological effects of MM-EMR and acupuncture theory of TCM resulted in the procedure known as extremely high frequency (EHF) puncture [34, 41].

EHF-therapy without individualization frequencies of MM EMR as well as irradiated zone.

When this version of EHF-therapy was developed, it was focused on the "resonance" mechanism of the interaction between MM-EMR and bio-objects [13, 14, 21]. However, they applied only two or three frequencies: 42.19 GHz (7.1 mm), 53.53 GHz (5.6 mm) or 60.12 GHz (4.9 mm). Sometimes during the whole course of treatment, only one frequency was applied, but in other cases, several (two to three) frequencies were used in turn or in combination. "Individualization" of these frequencies was carried out on the basis of modern nosological diagnosis or on the basis of results obtained through EHF-influence upon blood cells *in vitro* [42].

Usually, the skin of the Zakharyin-Head's zones, bug joints, sternum, epigastrium, or occiput area was irradiated [43]. The course of treatment consists of 10-20 sessions for durations of 15, 30, or 60 minutes.

During this version of EHF-therapy, the GAS effects played the main role. Therefore, individualization of the treatment was based on the controlling the adaptation reactions of the organism [44].

Device for EHF-therapy.

At the beginning of the experimental and clinical works, technical generators of coherent MM waves G4-141 (with frequencies of 37.75-53.57 GHz) and G4-142 (53.57-78.33 GHz) were used.

In later investigations, special medical devices of coherent and "noise" MM radiation, providing modulation and sweeping, and equipped with dielectric wave-guide or horn antenna were devised and manufactured (fig. 1).

Every version of EHF-therapy requires specific apparatus.

For individual frequency EHF-therapy, a broad stripe generator – with changeable MM-EMR frequencies – is necessary. It also must be able to initiate sensory reactions on the certain frequency, which is accepted as a "resonance" frequency (G4-142, "Ariya," MRT, etc.) [7, 10].

For EHF-therapy with individual irradiated zone-acupoints (EHF-puncture), generators with coherent or "noise" radiation and with dielectric waveguide usually are applied. Sensory reactions must appear during influence upon any selected acupoints (G4-142, "Ariya," MRT, "Artsakh," "Soliton," "Electronica-EHF", etc.) [7, 34, 35, 45, 46].

EHF-therapy without individual frequencies of MM-EMR as well as individual irradiated zone requires generators with horn antenna. "Yav-I" (5.6 mm and 7.1 mm), "Yarmaka," "Shlem," and "Baiur" devices are generally used [47].

Further device specialization for EHF-therapy incorporates several variations:

- Broadening and heightening of the applied frequencies (100.0-120.0 GHz and higher) [51, 52].
- Multi-channel devices for simultaneous influence upon several acupoints [53].
- Combined application of EHF, laser, or infrared radiation [54].
- Diagnostic-therapeutic complexes [55-56].
- Portable device for EHF-therapy [57].



Figure 1. Artsakh -03 device for Extremely High Frequency Therapy.

Indications.

Exact indications have yet to be established, due to the continuing development of new nosological forms. EHF-therapy has shown promise of high efficacy in the treatment of various forms of disease of the digestive, respiratory, cardiovascular and neural systems, and as well as several different syndromes and symptoms.

Counter-indications

MRT should not be used for conditions requiring surgery, or during pregnancy, and menses [7]. For EHF-puncture, absolute counter indications have not been observed. Diminished benefits have been seen in patients with a history of surgical interventions [34]. EHF-therapy without individualism frequency and irradiated zone should be applied cautiously in cases of bronchial asthma, vegetal-vessel disturbance, and high blood pressure exhibiting frequent crises [58].

Side-effects.

During application of MRT no side-effects have been revealed [7]. During application of EHF-puncture no side-effects attributable to MM-EMR were observed. Nevertheless, a wrong diagnosis (TCM syndrome) or an inadequate regimen of treatment may give rise or aggravate some symptoms of disease [34]. Urticaria was observed several times when EHF-therapy, without individualization of both the frequency and the irradiated zone, was applied in conjunction with medicinal therapy [59].

Conclusion.

EHF-therapy is a result of successful collaboration of scientists from the various fields of physics, biology, and medicine. Ongoing investigations should be undertaken to reveal and understand all mechanisms which underlie biological and therapeutic effects of this new medicinal modality. Present experience strongly suggests EHF-therapy will be divided into three independent branches: Microwave Resonance Therapy (MRT), Extremely High Frequency (EHF) Puncture and Extremely High Frequency (EHF) therapy (the third version of EHF-therapy), and each modality will assume a role in modern medicine.

References

1. Deviatkov N. (ed.): Application of low intensive millimeter radiation in medicine. – Moscow, Institute of Radio-Engineering and Electronics (IREE), USSR Academy of Sciences, 1985; 284.
2. Deviatkov N. (ed.) Medico-biological aspects of MM radiation. – Moscow, IREE, USSR Academy of Sciences, 1987; 280.
3. Deviatkov N. (ed.): Millimeter waves in medicine and biology. – Moscow, IREE, USSR Academy of Sciences, 1989; 307.
4. Sit'ko S (ed.): Fundamental and applied aspects of applications of millimeter electromagnetic radiation in medicine (abstracts) – The first all-union symposium with international participation. Kiev, Provisional research collective "Otklik", May 10-13, 1989; 404.
5. Millimeter waves of non-thermal intensity in medicine: – International symposium, (digest of papers), Parts 1-3. Moscow, October 3-6, 1991; 752.
6. Millimeter waves in medicine and biology: 10th Russian symposium (with participation of foreign scientists) (digest of papers). – Moscow, April 24-26, 1995; 260.
7. Binyashevskii E., Grubnik B., Derendiaev S., et at: Collection of the methodical recommendations and normative acts of Microwave Resonance Therapy (MRT). – Kiev, Little Joint Publishing House "Oberig", 1992.
8. Sitko S., Mkrтчian L., Derendiaev S, et al. "Physics of the Alive" in medico-biological aspects. – Physics of Alive (Biophysics and beyond), Kiev, 1993,1 (1): 110-131.

9. Adamenko V., Vylenskaya R., Golant M, et al: EHF influence on the air microflora in apartments. – Electronics series, EHF electronics, 1966; (12); 132-136.
10. Andreyev E, Bely M, Sitko S: Human reactions on the electromagnetic radiation to millimeter band. – Vestnik of the USSR Academy of Sciences, 1985, N1; 24-32.
11. Cooper H, Littlepage R: Electric countermeasures (ECM). – Microwave Journal. 1992; 35 (9) Sept. 22-36.
12. Ryde J, Ryde D: Attenuation of centimeter and millimeter wavelengths by rain, hail, fogs and clouds. – General Electric Co., Ltd., England, Report No. 8670, DDC No. AT 1146 168.
13. Deviatkov N, Golant M.: About exposure of coherent EHF oscillation irradiating by living organisms. – In [2], 1987; 126-130.
14. Golant M, Sotnikov O: About ultra-structural provision of electromagnetic coupling in the systems of living cells. – In [2], 1987; 131-137.
15. Betskii O, Ilijina S: The skin and the problem of millimeter wave interaction with biological objects. – In [3], 1989; 296-302.
16. Petrov I, Betskii O: To the question about mechanism of biological action of low intensive electromagnetic millimeter radiation. – In [3], 1989; 242-248.
17. Gizhko V, Sitko S: Coherent microwave electromagnetic field as a Physical model of microscopic quantum states of the multicellular organism. – Physics of Alive (Biophysics and beyond), 1993; 1(1): 103-109.
18. Ilijina S: Influence of low intensive electromagnetic radiation upon the properties of the isolated erythrocytes membranes and upon the hemoglobin of the human blood. – In [2], 1987; 149-160.
19. Sevastjanova L: Biological actions of radio waves of millimeter band on the normal tissue and malignant tumors. – The Effects of non-thermal exposure of millimeter radiation on bio-objects. Deviatkov N (ed.), Moscow, TREE, USSR Academy of Sciences, 1983; 48-62.
20. Sevastjanova L: Peculiarities of biological action of radio waves of MM band and possibility of their application in medicine. – Vestnik of Academy of Medical Sciences of the USSR, 1979; N 2, 65-68.
21. Deviatkov N, Golant M: About mechanisms of non-thermal MM EMR influence upon vital activity of organism. – The effects of non-thermal exposure of millimeter radiation on bio-objects. Deviatkov N (ed.), Moscow, IREE, USSR Academy of Sciences, 1983; 18-33.
22. Didenko N, Perelmuter V, Gurevich: The initiation of electromagnetic oscillations of MM band on the blood system in accordance with the side of influence and initial condition of the animals. – Biophysics, 31 (5); 882-885.
23. Cherniakov G, Korochkin V, Babenko A, et al: Reaction of biosystems of different complexity on the influence of low intensive EHF-radiation. – In [3], 1989; 140-167.
24. Teppone M., Vetkin A., Kalin A., Krotenko A.: Extremely High Frequency Therapy of duodenal ulcer. – Klinicheskaya meditsina, 1991; 69 (10); 74-77.
25. Selye H., A syndrome produced by diverse noxious agents. (Lond) – Nature 1936; 138: 32.
26. Meyerson F: Adaptation, stress and prophylaxis. – Sciences, 1981; 278 p.
27. Panin L: Biochemical mechanisms of the stress. – Sciences. 1983; 233 p.
28. Zhukova X, Yakoviev A.: Neuroendocrine system reaction of the patients having peptic ulcer to microwave resonance therapy. – In [4], 1989; 193-194.
29. Mukhina L, Zhukova T: Biochemical criteria of efficacy of peptic ulcer microwave resonance therapy.– In [4], 1989; 200-202.
30. Govallo V, Kamenev Y, Rebrova T: The criteria of choice of the millimeter radiation parameters in clinical practice. – In [3], 1989, 47-50.
31. Alisov A, Os'kin A, Sablin I, et al: Preliminary results of application of the electroencephalographic criteria for individualization of the frequency of electromagnetic radiation of millimeter band in treatment of peptic ulcer. – The 7th all-union seminar: Application of low intensive EHF-radiation in biology and medicine (abstracts), Zvenigorod, Moscow, November 13-15, 1989; 8.
32. Turanskii V, Kirichenko G, Volkov V: EHF-electromagnetic waves influence upon motor activity of the digestive tract of the peptic ulcer patients. – Ibid. 1989; 9.
33. Teppone M, Tcheglov V, Simakova A: The methods of improvement of the regimen of EHF-therapy. – Ibid. 1989; 118.
34. Teppone M, Vetkin A, Krotenko A, Milyaev O: Polyzone EHF-therapy: EHF-Puncture. – In [6], 1991; 201-207.
35. Teppone M, Krotenko A: Sensory reactions during polyzone EHF-therapy. – In [7], 1995; 85-86.
36. Golant M, Sevastjanova N: Radio-electronic grounds of the possibility to apply EHF-generators radiating only one frequency to treat different diseases. –Electronic techniques, series of Electronics EHF, 1989; 6 (240); 48-53.
37. Ilyina S, Bakaushina G, Gayduk V, et al: About possible role of the water in transmission of the millimeter radiation influence upon biological objects. – Biophysics, 1979; 24(3); 513-518.
38. Buvin G, Berlin Y: Device for reflex diagnostics with the UHF methods. – The modern aspects of reflexodiagnosics and reflexotherapy. Rostov on Don, 1984; 168-187.
39. Charnfiault A, Nghi NV: Traite de Medicine Chinoise: L'Energetique humaine en Medicine Chinoise. – . Angouleme, 1969; T 6; 463 p.
40. Deng L, Gan Y, He S, et al: Chinese acupuncture and moxibustion. / Chief ed. Cheng Xinnong, – Beijing, Foreign Language Press, 1987; 544 p.
41. Teppone M, Kostianov I, Krotenko A: Syndromes of Traditional Chinese Medicine in EHF-Puncture. – The first Congress of the European Association of acupuncture, Chishinew, Moldova, October 6-9, 1994; 75.
42. Poslavskii M, Zdanovich O, Parfenov A, et al: Peculiarities of the millimeter electromagnetic radiation influence upon blood rheology and possibility of individual choice of the treatment parameters. – In [3], 1989; 20-25.
43. Rodshtat I: Physiological grounded versions of the therapeutic influence of millimeter radio waves on the human skin. – In [3], 1 989; 72-82.
44. Garkavii L, Kvakina E, Ukolova M: Adaptation reactions and body resistance. Rostov on Don, – 1977.
45. Avakian R, Andreyev E, Taube A: The devices for Microwave reflexotherapy "ARTSAKH". – In [4], 1989; 346-347.
46. Pisanko O, Mus'kin Y, Khatniuk O., Gaiduk V: Instruments for EHF-Therapy "Elektronika – EHF", – In [7], 1995; 181-183.
47. Golant M, Dedik Y, Kuznetsov A: "Yalbot" devices for EFIF-diagnostic and "Yarmarka" apparatus for EHF-Therapy. – In [7], 1995, 177-178.
48. Drnitriev A, Panas A, Starkov S: "BRIZ" equipment for EHF-therapy. – In [6], 1991, 734-738.
49. Kotov V, Myasin Y, Kotov S: The "SHLEM-01-07" device in the two-wave apparatus for the EHF-therapy with quasi-optical output of the radiation. – In [7], 1995; 190-191.
50. Orekhov Y, Khokhrin L, Matusis L. et al: The apparatus for two-frequencies therapy "BAIUR-01"–In [6], 1991, 746-748.
51. Betskii O, Borisov V, Galanin A, et al.: Therapeutic device in the short-wave part of the MM band (2.53 mm). – In [7], 1995; 189-190.
52. Balakirev M, Bessonov A: Device for MM-wave therapy "MTN1TAG". – In [7], 1995; 197-199.
53. Vetkin A, Saveliev S, Nalivaiko B, et al.: Apparatus for multi-channel EHF-Puncture. – In [7], 1995; 192-193.

54. Antonov S, Betskii O: Therapeutic apparatus "LUCH-I" with simultaneously modulated laser and EHF-radiation. – In [7],1995; 186-187.
55. Deviatkov N, Kislov V, Kislov V, et al.; Therapy diagnostic complex "SHARM" – In 7, 1995; 178-179.
56. Yatsunenکو A, Nalivaiko V, Prokhorov E: Development of the "LUCH-EHF" therapeutic and diagnostic complex. – In [7],1995; 185-186.
57. Pisanko O, Mendrul N, Betson A, Khatniuk O: Portable device "ELECTRONTKA-EHF 011" for information MM-wave therapy. – In [7],1995; 183-184.
58. Poslavskii M, Golovatiuk A, Zdanovich O, et al.: Peculiarities of EHF-therapy in treating some human diseases: – The 7th all-union seminar: Application of EHF-radiation of low intensity in biology and medicine. Zvenigorod. Moscow, IREE. USSR Academy of Sciences, November 13-15, 1989; 4.
59. Gunko V, Kozhina N: Some complications of EHF-therapy. – Millimeter Waves in Medicine and Biology, Moscow, October, 1993; N 2; 102

[\[Home\]](#) [\[Articles\]](#) [\[Contact Us\]](#)