Coherent Microwave Electromagnetic Field as a Physical Model of Macroscopic Quantum States of the Multicellular Organism

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Grounding on the qualitative analysis of equations the semiclassic radiation interaction theory discussed in respect to the millimeter range of wave lengths and water medium of biological objects the general characteristics of electromagnetic limit cycles are analyzed in respect to the peculiarity of human anatomy. The correspondence between these characteristics and laws of classical acupuncture system meridian topography is determined. The conditions of quantification of coherent electromagnetic field orbits are under discussion as general conditions of stability of different forms of multicellular organism on all stages of morphogenesis.

INTRODUCTION

When going on from protozoa to multicellular organisms, we can observe new common peculiarities of their response to low-intensity millimeter electromagnetic radiation (mm EMR) [1-3]. Correlation between the organism's points sensitive to the mm EMR therapeutic action and the classical Chinese acupuncture zones seems to be of particular interest [4].

As mentioned above we shall show that the radiation field limit cycle that arises in the model of active cellular centers in an absorbing medium allows us to explain the acupuncture meridian's topography and its connection with organism's anatomy. Therefore, a process of complication of multicellular organism consists with respect to resonant microwave effects in creating its own coherent radiation field.

Properties of stable states of coherent electromagnetic radiation field make it possible to interpret easily the experimentally observed salient features of the resonant therapeutic action of the external mm EMR.

Consistently developed, the proposed idea is also useful in describing the papillary patterns on the palms and feet as well as in defining the biological role of the coherent mm EMR field of the organism. Quantization of orbits of the EMR-field one-photon states is a general condition for multicellular organism forms to be stable at all stages of morphogenesis.

ACTIVE CELLULAR CENTERS IN AN ABSORBING MEDIUM

Suppose that in the cell there may exist a selected pair of states between which the resonant microwave radiative transitions -- the cellular bioresonance (CBR) - is allowed. Considering possible nonequilibrium character of these states we can estimate that intensity of

pumping the upper state under which over-an-ensemble amplification of the CBR may exceed the loss by absorption in the medium. Setting the linear absorption coefficient equal to its typical value 30 cm^{-1} [5], we find that the rate of radiative transitions in the presence of thermal (Planck's) radiation is about $5 \cdot 10^5$ cm^{-3}s^{-1}. Then at the cells concentration 10^7 cm^{-3} and CBR concentration 1 per cell, the population inversion 1% and probability of spontaneous radiation 0.1 s^{-1}, the induced radiation rate of the active transition will exceed the rate of absorption by the medium. The derived probability of spontaneous radiation is by several orders of magnitude less than its basically possible value for the microwave range [6]. Note that if thermalization or participation in chemical reactions are negligible, then the difference of populations of the states under consideration proves to be strongly saturated: here the saturation parameter are equal to the ratio of the rates of induced and spontaneous radiative transitions, i.e., $kT/h\nu$ under thermal equilibrium.

At the frequency 60 GHz, this ratio is about 100. Therefore, with the rates of chemical reactions or thermalization that are no more than 100 times as many as those of spontaneous decay, saturation of the inverse occupation caused by radiation becomes a factor even at thermal densities of the radiation. Within a semiclassical approach to treating an infinite one-dimensional system of active centers with the aid of the Bloch-Maxwell equation, considering absorption and saturation in the slow-varying amplitude approximation, one can readily obtain an explicit expression of one limit cycle: the traveling wave of a definite amplitude. As this limit cycle exists at the resonance frequency, its phase velocity is determined exactly by the real part of the refraction index of the absorbing medium.

In the simplest generalization of the one-dimensional model – in three-dimensional medium with a homogeneous concentration of the amplifying CBR's – this limit cycle corresponds to a set of "whispering" modes, i.e., plane waves closed trajectories after reflections, repeated many times, from the volume boundaries.

ACUPUNCTURE POINTS AS POINTS OF REFLECTION OF THE TRAVELING WAVE

In a medium with refraction index in homogeneity the traveling wave may follow rather complicated trajectories. For example, the presence of the bones makes it possible to distinguish the inner and outer parts (relatively independent of each other) of the arm. In each of these parts the traveling wave trajectories must follow both the body surface shape and that of the corresponding bone surface. Particularly, within the sections with thick layers of muscular mass, the reflection points should be much more widely spaced than those within the thin sections.

Besides, in the bodies with an intricate surface the requirement, normally specified to the active modes, of the least loss under reflections, must lead to restrictions on the cross section of the traveling wave, so that the points of its reflection from the body surface are the size nearly this cross section.

The same minimal-loss requirement can serve as a criterion of structural stability of trajectories with respect to the group of natural deformations of the body. For example, there exists a simple possibility to ensure such stability with respect to articulation flexion – for this purpose, the trajectory must have a reflection point exactly opposite the flexure.

Examining the acupuncture point atlases [7] we have found that the points, supposed to be the ones of the plane wave reflection from the body surface, are located in excellent agreement with these conclusions. Joining the points of successive reflections of the wave coincides with a Chinese meridian. In Fig. 1 the lung meridian points are presented; the supposed trajectory (depicted with solid line) of the traveling whispering mode illustrates the general principle of correspondence between the acupuncture points and peculiarities of organism's anatomy.

Coordination between form of the body and arrangement of the meridians allows us to think that similar self-consistency is inherent in all the stages of ontogenesis, so that the growth rates and type of cell differentiation can be determined by structure and parameters of coherent microwave fields that, in their turn, can change following the changes in the cell types and the shapes of organs and tissues.
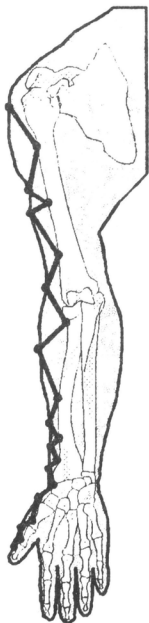
From the outlined point of view, the methods of needle acupuncture and tsubotherapy (impressing metal balls into the skin at the acupuncture point) are based upon introducing additional local loss due to diffraction of the wave by the introduced inhomogeneity. A similar effect should be initiated by exposing the point to an external resonant electromagnetic field – even a weak field should saturate the population inversion at the irradiated point, leading to the growth of loss for the active mode which passes through the point. Thus, the subsequent (with respect to the meridian's direction) part of the mode "switches off" from the influence of the preceding part; along the meridian there may also take place a direct pumping due to scattering the external radiation into a necessary mode.

Fig. 1 Right hand with the bones and meridian points of lungs. The supposed trajectory of a travelling "wispering" mode is drawn by a full line

Next, active nature of the meridians accounts for their ability to swerve nature of the meridians accounts for their ability to swerve from the classical trajectories. For example, there exist the "magic" meridians. Rudenko's meridian [8] is another example. Deviations of the meridians from their classical trajectories serve as a flaw detector, revealing the changes of dielectric characteristics or metabolic activity of cells (organs).

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PAPILLARY PATTERNS OF PALMS AND FEET
AS A MICROWAVE HOLOGRAM

Here we give some evidence of the fact that the papillary patterns are in phase with the interference patterns of two opposing coherent microwaves.

a

b

Fig. 2 *a* – roentgenogram of a hand finger with a supposed wave trajectory; *b* – imprint of papillar lines of the same finger

In Fig. 2a the suggested wave trajectory is marked on the finger radiograph, and Fig. 2b shows the fingerprint of the same finger. The value of the angle included between wave vectors is not constant, and its variations display the intricate shape of the finger phalange bones. Variations of the interference pattern period *d* are connected with those of the angle *v* included between the wave vectors of the interfering waves by the elementary relationship

$$d = \lambda / 2 \sin(\theta/2),$$

where *d* is a interference picture period, λ is the wavelength of the organism, θ – an angle between the wave vectors of interfering waves.
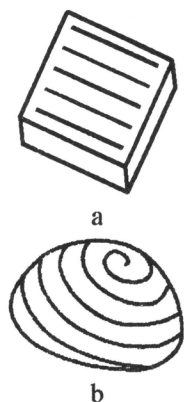

a

b

Fig. 3 Dependence of a picture of interference lines on a model form of the phalange surface: *a* – the case of the flat surface; *b* – the case of the spherical surface

As it is known from observations of formations of papillary patterns on the finger distal phalanges of embryos, the beginning of comb formation coincides with that of cartilage hardening. Besides, an arched pattern is always formed on a flat phalange, whereas a curled one – a phalange that has a pronounced convex shape at the beginning of comb formation [9]. Our hypothesis fits these facts. With the beginning of cartilage hardening, the necessary structure of the wave field arises. As for the dependence of the interference pattern on the phalange surface shape, it is shown in Figs. 3a, 3b. In the case with a spherical surface (Fig. 3b), the plane that contains the wave vectors of interfering waves does not pass through the center of the sphere.

As papillary pattern formation begins with accelerated division of cells of the basal layer on the sites of combs to come [9], we necessarily conclude

that intensity of the intrinsic coherent microwave field is able to control mitotic activity of the basal cells.

In cases of deep lesions of palm areas (for example, under radiation burns), the period of restored papillary lines changes markedly. Such change can be explained with the supposition that newcoming combs are directed along the interference lines whose period has changed due to local changes in the dielectric permeability of subcutaneous tissues.

This conclusion conforms to the known resonant microwave action upon the growth of yeast [10]. A possible role of the coherent microwave field in multicellular tissue growth controlling was also discussed by Fröhlich, 1978, [11] who considered the longitudinal component of the electromagnetic field in the pre-wave zone of a macroscopic dipole. We point out the regulatory role of the radiation field transversal component.

Similarly, of special interest are the clinical observations, previously done at the chair of skin diseases of the Kiev Medical Institute [12], also our recent observations which show the correlation between acupuncture points and those of cutaneous lesions under some forms of psoriasis. It is known that the main biological feature of the skin of the psoriasic areas consists in (6÷7)-fold increased mitotic activity of the basal cells [13]. It is also observed that the cell culture from psoriasic areas reacts to biochemical signals just as the culture of normal skin cells [14]. Therefore, correlation between the psoriasic areas and points of Chinese meridians may suggest the change in intensity of the coherent electromagnetic wave running along the meridians.

Thus, the example with papillary patterns can serve as a model of participation of the organism's coherent microwave fields in morphogenesis and sustaining the constancy of supracellular structures. We believe that further development of this lead will answer the question about the biological role of the organism's coherent electromagnetic microwave radiation that is connected, in line with the above, with the system of Chinese meridians.

CONCLUSIONS

The presented hypothesis unifies the following, absolutely disconnected up to now, fields:

- topography of acupuncture points and Chinese meridians (the former is identified with the points of complete internal reflection of the organism's intrinsic electromagnetic coherent wave propagating along a closed trajectory, with its projection into the body surface coinciding with the Chinese meridians);

- resonant biological effects of microwaves (resonant therapeutic effects, originated from microwave irradiation of acupuncture points, are interpreted as a result of the interaction between the external resonant field and the organism, with the latter being considered as an active medium that generates its own coherent electromagnetic wave);

- origin of papillary patterns on the palms and feet (the papillary patterns are a materialized and permanently renewed microwave hologram of the organism).

From such a standpoint, in each of these fields many previously obscure questions become clearer. Therefore, we believe that our hypothesis can serve as a program of the nearest experimental study, and that its main ideas will form part of both future theories of microwave resonant therapeutic effects and physical description of the development and stability of multicellular organisms.

However, apart a certain success, we realize that the proposed hypothesis can be unambiguously verified only by a direct detection of the postulated coherent microwaves. If such a proof appears, we must recognize that generation of the coherent electromagnetic radiation is not a mere analogy (see H. Haken, 1980) but a very essential part of the most striking self-organization process – the life on the Earth.

КОГЕРЕНТНЕ МІКРОХВИЛЬОВЕ ЕЛЕКТРОМАГНІТНЕ ПОЛЕ ЯК ФІЗИЧНА МОДЕЛЬ МАКРОСКОПІЧНИХ КВАНТОВИХ СТАНІВ БАГАТОКЛІТИННОГО ОРГАНІЗМУ

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На підставі якісного аналізу рівнянь напівкласичної теорії взаємодії випромінювання стосовно до міліметрового діапазону довжин хвиль та водних середовищ біологічних об'єктів розглянуто можливість того, що при врахуванні істотної нелінійності взаємодії поля у дворівневій системі рівнянь Блоха з феноменологічними сталими релаксації у випадку інверсії населеностей одноклітинних станів для класичного поля випромінювання існують стаціонарні рішення з властивостями граничного циклу. Проаналізовано загальні властивості електромагнітних граничних циклів з урахуванням особливостей анатомічної структури людини, встановлена відповідність між цими властивостями та закономірностями топографії системи меридіанів класичної акупунктури.

Умови квантування орбіт когерентного електромагнітного поля обговорюються як загальні умови стійкості форм багатоклітинного організму на всіх етапах морфогенезу.

КОГЕРЕНТНОЕ МИКРОВОЛНОВОЕ ЭЛЕКТРОМАГНИТНОЕ ПОЛЕ КАК ФИЗИЧЕСКАЯ МОДЕЛЬ МАКРОСКОПИЧЕСКИХ КВАНТОВЫХ СОСТОЯНИЙ МНОГОКЛЕТОЧНОГО ОРГАНИЗМА

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На основании качественного анализа уравнений полуклассической теории взаимодействия излучения применительно к миллиметровому диапазону длин волн и водным средам биологических объектов рассмотрена возможность того, что при учете существенной нелинейности взаимодействия поля в двухуровневой системе уравнений Блоха с феноменологическими постоянными релаксации, в случае инверсии населенностей одноклеточных состояний, для классического поля излучения существуют стационарные решения со свойствами предельного цикла. Проанализированы общие свойства электромагнитных предельных циклов с учетом особенностей анатомической структуры человека, установлено соответствие между этими свойствами и закономерностями топографии системы меридианов классической акупунктуры.

Условия квантования орбит когерентного электромагнитного поля обсуждаются как общие условия устойчивости форм многоклеточного организма на всех этапах морфогенеза.

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