Chiral Factor of Circadian Rhythm of Human Physiology

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ABSTRACT

In the process of phylogenesis under the influence of the radiation of the Sun - electromagnetic during the day and a neutrino at night in the human brain the morphofunctional apparatus responsible for the circadian rhythm «day-night» was formed. Synergism of chiral neutrino radiation and decrease in brain temperature in a sleep attracted to explain the mechanism of activation of melatonin biosynthesis in the epiphysis of a sleeping man. With cooperative molecular dynamics in biosystems, containing water and chiral molecules, the mechanism of their reaction to the action of quanta of chiral radiation genetically related to solar neutrinos has been associated. The flux of quanta of neutrino energy flows around the earth along the lithosphere both along a waveguide with a velocity close to that of surface seismic waves and affects the biosphere at night. As a result of the orienting effects of chiral quanta on the spin magnetic moments of electrons and nuclei of chiral molecules, the chirality of the biosystem and its chemical potential increase. Because of the rotation of the Earth around its axis the maximum flux of neutrino radiation and, correspondingly, the efficiency of the melatonin biosynthesis process in the epiphysis shifts to 2-3 o'clock of night. The intensity of the flux of neutrino energy emerging from the earth depends on the time of year, which can provoke seasonal changes in the human psyche, and the geographical features of the entry and exit points of the flow could determine the differentiation of the genotype of people on racial and religious-cultural features.

Keywords: *melatonin, epiphysis, circadian rhythm, Sun, chirality, Earth rotation.*

INTRODUCTION

Until now, when studying the neurophysiology of cognitive functions, the functional asymmetry of the brain, the chirality of biomolecules and fluid media of the brain, cooperative effects in homogeneous biosystems, the phenomenon of EM induction and the influence of physical factors of the geocosmic nature on the brain of a sleeping person are not properly taken into account. Such factors include the universal biogenic factor (UBF), whose action, apparently, is connected with the genesis of dissymmetry of living systems [1].

In the process of phylogenesis, an anatomical and physiological complex was formed in the human brain, regulating homeostasis in accordance with the circadian rhythm of day-night. The wakefulness regime is directly connected with the excitation of the visual system of the brain by the light of the sun of the optical range and by the biosynthesis in the organism of the neurotransmitter serotonin (CE), the most important regulator of the day metabolism [2].

Similarly, the action of the UBF of the solar nature on living systems at night can be responsible for the genesis of the features of the physiology of sleep, which, in particular, are manifested by dreams and fast sleep phases [3]. Earth at night completely screens the effect on the biosphere of EM radiation, but does not interfere with the influence on the biosphere at night of the solar neutrino, which is chiral and has a high penetrating ability in stagnant environments. Taking this into account, energy quanta of neutrino nature are presumably attributed to UBF [4]. The participation of UBF in the mechanism of circadian rhythm generation presupposes the presence in the human body of a chiral biochemical system capable of condensing and metabolizing quanta of neutrino energy.

The basis of such cooperative biosystems is water and chiral metabolites embedded in the supramolecular dynamic structure of water [5,6]. These conditions are completely satisfied by the anatomy and molecular-cellular structure of the epiphysis, in which night with the participation of enzymes and chiral

norepinephrine and tryptophan the hormone of night and reproductive metabolism - melatonin (ME) is synthesized.

We note the following distinctive features of the physiology of CE and ME: 90% of CE is synthesized in the body by the cells of the mucosa of the digestive tract, and primarily in the colon [7], and 10% in the epiphysis. And CE, synthesized in the digestive tract can not overcome the blood-brain barrier. The maximum efficiency of biosynthesis of ME from CE in the epiphysis is observed in the region of 2-3 hours of the night (Fig. 1). These

features of the physiology of ME and CE still have no explanation.

In this paper, based on the well-known laws of electromagnetism and elementary particle physics, we modeled the structure of chiral energy quanta isomorphic to neutrinos and proposed a probable mechanism of their interaction with biosystems. To explain the dependence of melatonin synthesis on the intensity of UBF, the influence of the rotation of the Earth and the structure of the lithosphere on the propagation velocity and density of the neutrino energy leaving the earth attracted.
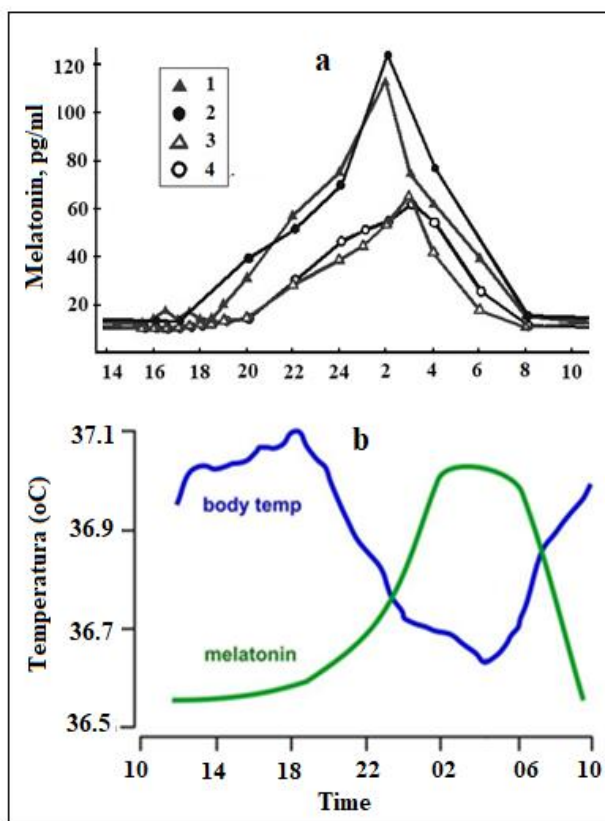

Fig1. *Melatonin content in the blood plasma at different times of the day: 1, 2 - young men and women; 3, 4 - elderly men and women, from [8]. (b) The daily timing of temperature of the human body and the content of melatonin in the blood plasma, from [9].*

MODELING OF CHIRAL ENERGY QUANTA

To simulate the structure of energy or particle quanta, one should use the simplest dynamic form of matter - energy form (EF) [10]. Despite the fact that there are no technical methods for direct recording of EF inside and outside the brain, their effect is manifested in the "vision" of the brain by dreams and pressure phosphophenes or magnetophosphenes [3]. EF can also participate in the generation of EM pulses detected by EEG and EMG methods [11].

The model of the simplest EF is constructed taking Maxwell's equations into account for the

EM field (1) and extrapolations of the EM-induction phenomenon (Fig. 2):

$$\text{rot } \mathbf{E} = -\partial \mathbf{B}/\partial t \text{ и rot} \mathbf{H} = \mathbf{j} + \partial \mathbf{D}/\partial t. \qquad (1)$$

In (1), E and B are mutually orthogonal vectors of the strength of the vortex electric and magnetic fields, $\mathbf{D} = \varepsilon_o \varepsilon \mathbf{E}$, $\mathbf{B} = \mu_o \mu \mathbf{H}$, j is the bias current, and the electrodynamic vacuum constant ($\varepsilon_o \mu_o$) and the refractive index of the medium are related to the propagation velocities of the EM quanta in Vacuum (C) and medium (V) by the relationships:

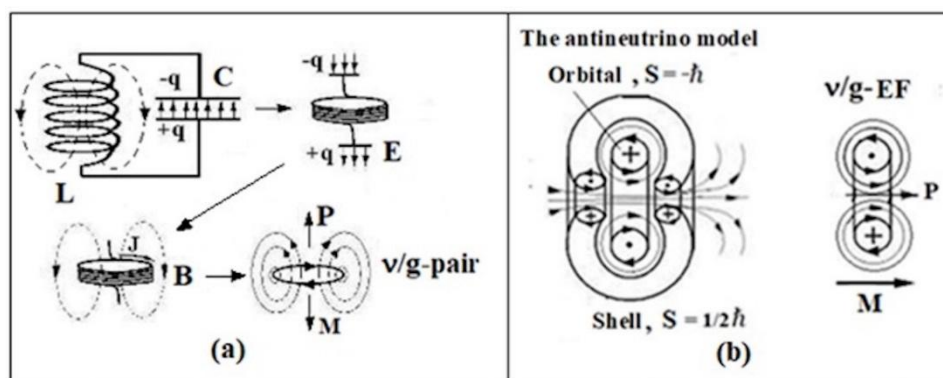$$C = (\varepsilon_o \mu_o)^{-1/2} \text{ и } V = C(\varepsilon \mu)^{-1/2} = C/n. \qquad (2)$$

Fig2. *(a) Vibrational contour, its transformed forms and their extrapolation to the level of the energy form (ν/g-pair) having the impulse P, момент импульса M and the equivalent mass m_g. (b) Antineutrino models (spin S = -ℏ/2) and right-handed ν/g-EF (P - momentum, M - angular momentum).*

In Fig. 2 shows ν/g-pair modeling a left-handed photon or vortex, in which the momentum and angular momentum are directed in opposite directions. From ν/g-pair, one can construct vortex models of elementary particles and nuclei [10]. For example, the antineutrino model will include an ν-shell and a g-orbital with spins ½ and -1, respectively (Fig. 2).

The assembly of ν/g-pair particles or EM energy quanta corresponding to the excited state of a molecule or a biosystem was represented by the condensation equation N of the ν/g-pair in the form [10]:

$$\frac{N\hbar C}{R_\nu} = \frac{\hbar C}{r_e} \qquad (3)$$

In (3), Rν and re correspond to the characteristic dimensions of the ν vortex ν/g-pair or the particles and electron orbitals of the molecule or molecular cluster, respectively. The interaction of chiral EFs with a biosystem consisting of chiral molecules or chiral chromophores is realized analogously to the interaction of quasiparticles of magnons with nuclei and electrons having nonzero magnetic moments. Absorption of the particle by the particle will lead to a reorientation of the magnetic moment and will affect the spin-spin and spin-orbit interactions of chiral chromophores determining the anisotropy level of the electronic structure of the entire molecule and its chirality. Lowering the temperature of the brain in a dream stabilizes induction-orientation effects of ν/g-EF in chiral biosystems, including hormone-enzyme complexes. This will change the level of cooperation of chiral elements in homogeneous systems of molecular complexes and supramolecular ensembles in brain tissues. As a result, the chemical potential will increase, and the kinetics of biochemical reactions will become more dependent on the chirality of the molecules [1].

CHIRAL PHYSICS OF THE EPIPHYSIS

The physics of elementary particles [12] allows the decay of the solar neutrino in the interplanetary space to the isomorphic energy forms (ν/g-EF), consisting of the ν-shell and the g-orbitals (Fig. 2).

A key feature of sleep physics is biosynthesis in the epiphysis of the hormone melatonin (ME), the maximum content of which in the blood is observed at 2-3 o'clock in the morning. The time dependence of the synthesis of ME is regulated by the pair suprachiasmatic nucleus (SCN), the main rhythm generator of the brain [3]. SCNs have a neural connection with the retina of the eyes and the epiphysis [13]; therefore, in the daytime and under the illumination of the eyes, the SCN block the synthesis of ME, but initiate it in the dark due to its spontaneous activity, which does not cease even in the isolated state of the SCN. An important role in the activity of SCN is played by neuropeptide Y, whose structure is based on the α-helix of 36 amino acids [14].

The main stages of ME biosynthesis include the initiation of the suprachiasmatic nucleus into the epiphysis through the nerve endings of L-noradrenaline (HOA). NOA triggers the synthesis of the arylalkylamine-N-acetyltransferase (AANAT) enzyme. AANAT converts the L-tryptophan (TP) present in the epiphysis to CE, which, with the participation of the enzyme hydroxy-indole-O-methyltransferase, is converted to ME (Fig. 3). In addition to the chirality of participants in the biosynthesis of ME and the presence of α-helices from the sequences of chiral amino acids in the structure of enzymes, the dependence of

the yield of biosynthesis of ME on the effect on the epiphysis of the alternating magnetic field (MP) is related to the features of the epiphysis physics [15]. The limiting stage in the biosynthesis of ME is the initiation of L-noradrenaline (HOP) synthesis of the enzyme AANAT, whose activity rises by two orders of magnitude at night [13].
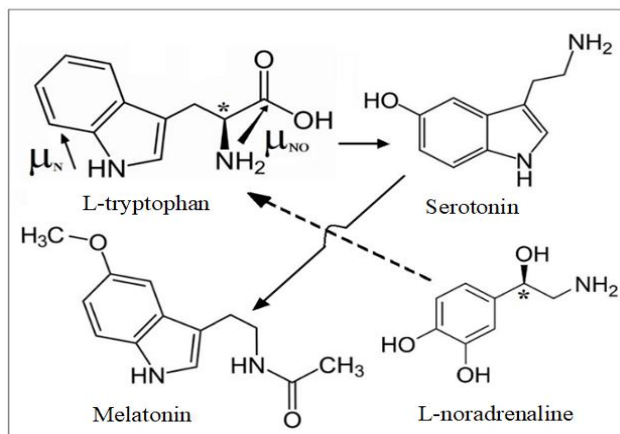

Fig3. *Structures of the main participants in the biosynthesis of melatonin from L-tryptophan, directions of dipole moments of its fragments are marked by arrows ($\mu_{NO} \sim 10D$), and asterisks are chiral carbon atoms.*

It was assumed in [4] that solar v/g-EFs flow around the Earth through its lithosphere (Fig. 4), which up to the boundary of the Makharovichich (h) consists of ~ 70% of silica containing equal amounts of L- and D-crystals quartz [1]. On the night side of the Earth, counter flows v/g-EF, merge and exit to the surface, affecting the biosphere. Taking into account also the magnetosensitivity of the epiphysis, a maximum of ME content at 2-3 nights (Fig. 1) was associated with the maximum density of the v/g-EF effluent leaving the earth at that time. The shift of this maximum from 0 hours to 2-3 hours was explained by the rotation of the Earth (ω) and estimated the velocity (V_v) of the v/g-EF flux across the lithosphere as in the waveguide.

Taking into account the Earth's rotation speed ($V_E = \omega R_E$) and the slope of its rotation axis (23°), the time of motion (t) of the v/g-EF flows before their meeting at the point of the circle corresponding to 2 o'clock in the night was expressed by the equation:

$$t = \frac{\pi R_3 - \frac{1}{6}\pi R_E}{V_v - V_E cos23^o} = \frac{\pi R_3 + \frac{1}{6}\pi R_E}{V_v + V_E cos23^o},$$

the solution of which gave $V_v \sim 2.8$ km/s. Knowing V_v and t, we can estimate the displacement of the exit point of the v/g-EF in longitude (S) relative to the diametral point of the occurrence of the v/g-EF flow into the earth. It will be:

$$S \sim tV_E sin23^o \sim 0.07\pi R_E \sim 1400 \text{ km or } \sim 13^o.$$

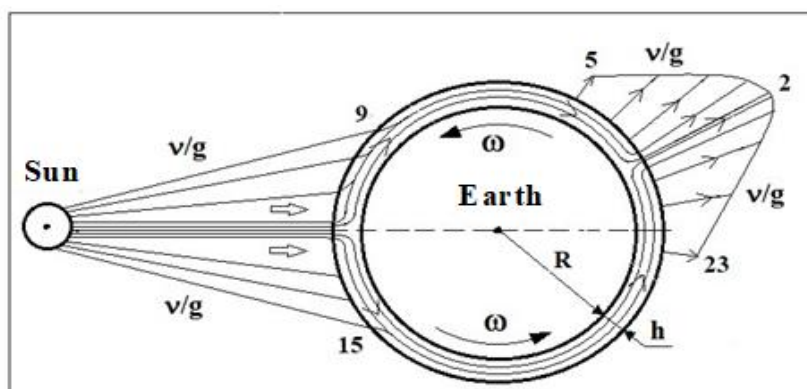**Fig4.** *Scheme of the flow of solar neutrino energyforms (v/g) along the lithospheric layer with thickness h ~ 10-50 km; number - time of day in hours.*

The obtained V_v estimate of the v/g-EF fluxes in the lithosphere is in good agreement with the magnitude of the propagation velocity of surface seismic waves over the Earth's crust and the probable nature of quasiparticles (magnon and polaron) that can participate in the mechanism of v/g-EF motion over the lithosphere [16]. The value of V_v varies depending on the coordinates

of the input of the ν/g-EF fluxes and the seasonal changes in the orientation of the Earth's rotation axis relative to the Sun. Corresponding changes in the density of the outgoing ν/g-EF flux affect the metabolism of the epiphysis and the physiological parameters of the reproductive function and psychophysics of a person that depend on it. The chirality factor in the biophysiology of the epiphysis will be transmitted along the neurohumoral links to other brain structures. Thus, UBF can participate in the generation of a functional brain asymmetry resource [4]. With seasonal variations in the ν/g-EF flux and its snow cover, it is possible to relate the decrease in the efficiency of biosynthesis of ME in the epiphysis in winter. A regular reaction of homeostasis will be an increase in the volume of parenchyma and the number of pinealocytes, which is consistent with the increase in the size and mass of the epiphysis in people living in the mid latitudes of the Northern Hemisphere and who died in November and January compared to people of a close constitution who died in May and July [13].

The differentiation in the Pleistocene epoch of the density and sign of the chirality of the outgoing flow of the ν/g-EF by the physical features of the lithosphere and hydrosphere (northern and southern hemispheres, faults in slabs, coasts, mountain massifs, fertile soils, deserts) was subsequently reflected in the racial and religious-cultural diversity of mankind, and also on the geography of dominant forms of carcinogenesis.

REFERENCES

[1] Kizel V.A. Physical causes of dissymmetry of living systems. M.1985. 120.

[2] Simonenkov A.P., Klyuzhev V.M. Syndrome of serotonin deficiency. Moscow: Publishing house Binom, 2013. 96 p.

[3] Kholmanskiy A. Modeling of brain physics. *Mathematical morphology. Electronic mathematical and Medico-biological journal.* 2006. 5 (4); http://new-idea.kulichki.net/pubfiles/180520162644.pdf

[4] Kholmanskiy A.S. Dependence of the resource of functional asymmetry of the brain on external conditions. *Asymmetry.* 2009. 3 (1). 51-6: http://cerebral-asymmetry.narod.ru/Asymmetry_1_2009.pdf

[5] Kholmanskiy A. Chirality anomalies of water solutions of saccharides. *Journal of Molecular Liquids.* 216 (2016) 683–687; http://dx.doi.org/10.1016/j.molstruc.2015.02.049

[6] Zaitseva N.V, Sitanskaya I.Yu., Kholmanskiy A.S. Dependence of the optical activity of solutions of terpenes and sugars on temperature. *Bulletin of the Moscow State Regional University. Series: Natural Sciences.* 2016. № 1. P. 57-63.

[7] Lychkova A.E. Serotonergic regulation of the motor function of the large intestine. *Therapeutic archive.* 2013. 2. P. 89-926.

[8] Belowashkin A. The temperature rhythm of our body: to understand and use. URL: http://www.Beloveshk in.com/2017/03/temperaturnyj-ritm-nashego-organizma-ponyat-i-ispolzovat.html

[9] Dean W., Morgenthaler J. Fowkes S. The Melatonin. Chapter from Smart Drugs II. 2000.

[10] Kholmanskiy A.S. Chirality and quantum effects as factors of morphogenesis. *Mathematical morphology: electronic mathematical and medico-biological journal.* 2010. 9. http://sgma.alpha-design.ru/MMORPH/N-28-html/kholmanskiy-2/kholmanskiy-2.htm

[11] Kholmanskiy A.S, Minakhin A.A. Interconnection of electrical oscillations of the heart and brain. *Bulletin of St. Petersburg State University. Medicine.* 2018. **13** (2).

[12] Klapdor-Kleingrothaus G.V., Staudt A. Non-accelerating physics of elementary particles. M. 1997.528 p.

[13] Kovalzon V.M. Foundations of somnology: physiology and neurochemistry of the cycle «wakefulness-sleep». M. 2014.239.

[14] Medanic M., Gillette M.U. Suprachiasmatic circadian pacemaker of the rat shows two windows of sensitivity to neuropeptide Y in vitro. *Brain Research*, 1993. **620** (2), 281-6.

[15] Temur'yants N., Shekhotkin A., Magnito sensitivity of the epiphysis. *Biophysics.* 1998. **43.** 761

[16] Aleshkevich V.A, Dedenko L.G, Karavaev V.A. Fluctuations and waves. Moscow State University, 2001.