

Letter to the Editor

Correction of aggregative thrombocytes activity in patients with unstable angina by THz irradiation of nitrogen oxide occurrence at in vitro conditions

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Abstract: There had been shown a normalizing effect of THz radiation of MEAS (molecular emission and absorption spectrum) of 400 GHz nitrogen oxide occurrence on aggregation parameters of thrombocytes in patients with unstable angina at in vitro conditions. 180 patients with an unstable angina had been involved in to the research.

Keywords: thrombocytes, unstable angina, THz irradiation, nitrogen oxide

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Introduction

Conversion modern technologies of bioenergoinformational exposure had indicated that a human organism is a self-adjusting and self-organizing system consisting of hierarchically self-similar cell structures.

In natural environment there is no monochromatic irradiations of the extremely high frequency band (EHF band), as they are lost to the atmosphere, water and aquatic mediums. This circumstance, taking into account a high information capacity, made some scientists focus their attention on it and came up original ideas of a significant role of electromagnetic waves (EMW) of EHF band in live system homeostasis support [1].

Electromagnetic waves of EHF band have been using in medical practice for more than 30 years. These are electromagnetic waves of 30-300 GHz occurrence [1].

This band has a variety of biological advantages. In experimental sets [2] there was displayed that cell during its vital process produces electromagnetic waves of a very wide band. In condition of a normal cell function the waves of the EHF band are of a noise character [2]. Certain electrical symmetry is typical to cells of an organism. This electrical symmetry is destroyed when there is a cell function failure. According to Le Chatelier's principle cells generate coherent electromagnetic waves of EHF. The aim of these waves is normalize the cell function [3].

It is expected that the exposure of the waves of EHF imitates cell regulating properties, normalize the defected cell function [4, 5]. So, there was fixed a significant reduction of initially high free heparine level produced by granule cells of tissues and basophils [6].

The major point of the EHF waves is membrane-informational system [7, 8] which influences cell membranes, stimulates its lipid

layer and protein components stirring [8], changing the cell functional activity.

It is known that cells in their physiological norm are not as sensible to EHF waves as cells with a pathological functional defect [2]. According to this idea, for studying the EHF waves exposure there should be used those cells for the experiment which function had been changed by some pathology.

The conception of the formed blood elements as of the primary aim of the EHF irradiation determines a specific interest of the scientists to the features of human erythrocytes and thrombocytes reaction on millimeter exposure [5].

To correct high aggregative thrombocytes activity in different forms of cardiac pathology (stable and unstable angina) the of THz radiation of MEAS (molecular emission and absorption spectrum) of 150.176-150.664 GHz nitrogen oxide occurrence [9-12] is used. Nitrogen oxide is a vasodilator, strong hemostasis factor and thrombocytes aggregation inhibitor [13-17].

After the performed experiments there had been indicated a significant reduction of the initial free heparine level in the patients with unstable angina, their blood was under EHF irradiation at in vitro conditions [6].

Nitrogen oxide together with molecular emission and absorption spectrums of 150.176-150.664 GHz and 240 GHz occurrence and 400 GHz occurrence [18]. So, we can suppose that reaction ability of endogenic NO molecules in biological media, for example, in thrombocytes rich plasma, will be maximal on this frequency.

Therefore, the research aimed to study the effect of THz radiation of MEAS of 400 GHz occurrence on a thrombocytes functional activity in the patients with unstable angina at in vitro conditions, in natural electromagnetic field.

Material and Methods

There had been studied changes in thrombocytes functional activity of 180 people with unstable angina under the radiation of MEAS of 400 GHz occurrence at in vitro conditions. The thrombocytes rich plasma (TRP) was under the radiation of MEAS of 400 GHz occurrence (the power density 1 mW/cm²) in the natural electromagnetic field. Median cubital vein blood sampling had been performed at first 6-12 hours after hospitalization (before specific therapy).

There were the following criteria of involving into the experiment: administration to the emergency cardiac department with unstable angina appeared during last 48 hours in the forms: rest angina (pain progressing in rest and in minimal strength, more than 5 minutes and less than 30 minutes); effort angina (in activity which had not caused it before); increase of angina episodes after confirming in ECG (T-wave inversion, ST segment increase more than 0.5 mm: not enough to detect an acute myocardial infarction).

There were the following criteria of excluding out of the experiment: incipient postinfarction angina; new-onset angina; new insults (less than 6 months); age is older than 70 years; the weight of the patients is 40 kg or more 110 kg; blockade of the left bundle of atrioventricular bundle (except the initial obstinate blockade); ST segment increase more than 1 mm in two contiguous ECG leads; implanted cardiostimulator; renal failure (creatinine more than 200 μmol/l); thrombocytopenia (less than 150*10⁹/l); liver failure; bacterial endocarditis; native or nonheritable hemostasis pathology.

All of the patients signed a written consent of taking part in the research which included clinical examination, echocardiography, 12-lead ECG, biochemical blood counts (concentration of: urea, creatinine, sodium and kalium ions, glucose, lipids, and triglycerids).

The patients included into the research had been matched in age and sex characteristics. An average age was 55.6±0.93 years.

There were 20 relatively healthy donors-subjects, an average age was 54.3±0.72 years.

Functional thrombocytes activity (activation and aggregation) had been determined by aggregation laser analyzer "Biola-230 Ltd." interfaced with IBM-compatible computer and special MS Windows soft «Aggr» (SPC "Biola") [19].

3.8% sodium citrate fluid was used as a blood anticoagulant in proportion 9:1. Thrombocytes rich plasma (TRP) to give, blood had been centrifuged in 1000 r/min mode during 10 minutes. TRP had been divided on two parts: experimental and control.

Experiments in studying the effect of THz irradiation of MEAS (molecular emission and absorption spectrum) of 400 GHz nitrogen oxide occurrence on functional thrombocytes activity in patients with unstable angina had been first organized by quasi-optical EHF generator of determinate noises.

The experimental TRP sample of the patients with unstable angina had been irradiated by THz waves during 15 minutes. The control TRP sample had not been irradiated and had been free of the air flow influence. The researches of the functional thrombocytes activity in experimental and control TRP sample had been performed simultaneously.

TRP in final concentration of 2.5 μm ("Helena", Israel) had been used as an inducer. The inducer was thrown at the 30th second from the beginning of the experiment.

Statistical analysis of the results had been done with the help of the Mann-Whitney U-test (Statistica 6.0 soft).

Results and Discussion

In the patients with unstable angina an increase of thrombocytes aggregation activity is fixed. This is reflected in statistically valid increase of the maximal speed of the most thrombocyte aggregate producing, maximal degree and aggregation speed comparing with the group of relatively healthy donors.

During the 15-minute THz irradiation of MEAS of 400 GHz nitrogen oxide occurrence exposure on TRP in the patients with unstable angina at in vitro conditions, in natural electromagnetic field, there was a significant reduction of thrombocytes aggregation activity which was accompanied by statistically valid decrease of the maximal thrombocyte aggregate size, maximal speed of the most thrombocyte aggregate producing, maximal degree and aggregation speed.

In comparison of the exposure effect of the THz irradiation of 240 GHz and 400 GHz on thrombocytes aggregation activity in the patients with unstable angina, the following results had been received. The 15-minute THz irradiation of 240 GHz caused the reduction of all thrombocytes aggregation parameters. It is important to point out that there was no recovery of functional thrombocytes activity up to the parameters of healthy people, but there was a significant decrease of aggregation activity in all parameters comparing with the control group. At the same time the results received after the TRP irradiating of 400 GHz were closer to thrombocytes aggregation activity parameters comparing with the control group of relatively healthy donors.

Thrombocytes aggregation depends on the activation of membranous glycoprotein thrombocytes receptors IIb-IIIa and developing of fibrinous bridges between them [20, 21]. An increase of fibrinogen concentration in blood leads to an increase of thrombocytes activity in the patients with unstable angina [22, 23].

It is possible that the mechanism of antiaggregative effect of THz irradiation of MEAS of 400 GHz occurrence on thrombocytes in the patients with unstable angina is caused by NO-synthetase and guanilatcyclase influence, leading to nitrogen oxide producing and cyclic guanosine monophosphate which are strong antiaggregants [14]. We can also suppose that THz waves, as well as EHF irradiation, is a factor of stimulating of molecular receptors of cell membranes, in distributing of which in intracellular space, there is an exposure on negatively charged glycoprotein threads of glycocalix of cell membrane [24], including thrombocytes which leads to their functional activity.

Besides, it is well known that between THz electromagnetic waves and thrombocyte aggregates there is a resonance interaction [11]. In aggregation the value of aggregate increases, and when they achieve the size of wave length, they resonate, this leads to deaggregation of thrombocyte aggregates in the patients with unstable angina.

Conflict of interest: none declared.

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