Nuclear Magnetic Resonance Spectroscopy in the Evaluation of Bioresonance Individual Therapy M.Yu. Gotovsky (Center for intelligent medical systems "IMEDIS", Moscow)

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#### SUMMARY

The structure and properties of water in the context of the formation of bioresonance means of individual therapy are considered. The results of studies by the method of nuclear magnetic resonance (NMR) spectroscopy of homeopathic remedies and a model of the supramolecular structure of aqueous solutions of substances in ultrahigh dilutions are analyzed. Experimental results of studying by means of NMR spectroscopy of aqueous solutions after their treatment with electromagnetic oscillations carrying medical information are presented. A change in the electron density of deuterons in aqueous solutions was discovered when the properties of homeopathic preparations were transferred to them using the device "IMEDIS-BRT-A".

Key words: NMR spectroscopy, aqueous solutions, ultrahighpotency, bioresonance means of individual therapy.

### RESUME

Structure and qualities of water are considered in context of creation of bioresonance means of individual therapy. Results of researches with nuclear magnetic resonance (NMR) spectroscopy of homeopathic preparations and model of supra molecular structure of water solutions of substances in ultra-high dilutions are analyzed. Results of experimental studies of water solutions treated by electromagnetic oscillations bearing remedial information with NMR spectroscopy are presented. Changes in electron density of deuterons in water solutions after transfer of qualities of homeopathic preparations with "IMEDIS-BRT-A" device were observed.

Keywords: NMR spectroscopy, water solution, ultra-high dilutions, bioresonance means of individual therapy.

### INTRODUCTION

Previously, the advantages and benefits of bioresonance means of individual therapy in the treatment of diseases of a particular patient were considered [1]. Bioresonance means of individual therapy can be obtained by processing (the term "transfer of properties" is also used) of carriers in a liquid or solid phase with electromagnetic signals containing therapeutic information.

Distilled water or isotonic aqueous solutions of mono- or divalent salts, as well as physiological saline, are often used as liquid carriers. Water is part of the overwhelming number of oral and parenteral dosage forms, which implies its indispensable participation in their therapeutic action. The unique properties of water as a donor and acceptor of protons determine the ability of its molecules to form intermolecular complexes not only due to van der Waals forces, but also due to hydrogen bonds. The structure of water and aqueous solutions is the subject of many years of research, as a result of which numerous theories have been created and various structural models of liquid water have been proposed: hexagonal by J. Bernal and R. Fowler, clathrate O.Ya. Samoilov, shimmering clusters of H. Frank and W. Wen (H. Frank and W. Wen), hydrated L. Pauling and others [2]. The studies carried out show that water is a dynamic and complexly structured molecular system, the properties of which determine its role in molecular biological processes [3]. A. Szent-Gyorgyi called water the "matrix of life", believing that "... biology may not have succeeded so far in understanding the most basic functions due to the fact that it focused only on matter in the form of particles, separating them from two matrices - water and an electromagnetic field "[4, p.55].

Recently, there has been an increase in the number of experimental works in which it is shown that the preliminary irradiation of the water system with alternating electromagnetic fields causes pronounced changes in it [5]. The subsequent interaction of such water with biological systems leads to responses that are recorded at various levels of biological organization - from cells to the whole organism. The use of water after exposure to electromagnetic fields for medicinal purposes with the use of a person's own electromagnetic fields, processed in the process of bioresonance therapy, turned out to be especially attractive [6].

Due to the fact that the mechanism of formation of bioresonance means of individual therapy is associated with a change in the structure and, accordingly, the properties of water under the influence of electromagnetic fields, it is advisable to study and analyze such changes. Quite extensive and objective information on the state of the structure of water can be obtained using nuclear magnetic resonance (NMR) spectroscopy.

## NMR SPECTROSCOPY METHOD

NMR spectroscopy is one of the methods of physicochemical analysis, with the help of which it is possible to obtain information about such properties of molecules as orientation, conformation, the nature of interaction with other molecules, as well as about the molecular environment [7]. The NMR method is possible due to the presence of a magnetic field in the nuclei of atoms or a nonzero magnetic moment, which is directed along the axis of their rotation (spin). When placed in a constant external magnetic field, the vector of this magnetic moment begins to precess with a certain frequency, which depends both on the properties of the nucleus and on the strength of the external magnetic field. In the case when, in addition to a constant external magnetic field, an alternating magnetic field will also act on the nucleus, the precession amplitude of the nucleus begins to increase due to the interaction with this field. (Larmor) precession, the nucleus begins to absorb the energy of the alternating field, and nuclear magnetic resonance sets in. Resonant absorption of the energy of an alternating magnetic field of the spins of nuclei placed in a constant external magnetic field constitutes the physical mechanism of NMR, and its spectrum characterizes the dependence of the amount of absorbed energy by a system of nuclear spins on frequency. The process of resonant absorption of field energy, accompanied by the transition of the nucleus from a lower energy level to a higher one and the transfer of energy to the intermolecular environment, is called spinlattice (longitudinal) relaxation and is characterized by the time T1. An excited nucleus can also transfer its energy to the same nucleus, but located at a lower energy level. This process is spin-spin (transverse) relaxation and is characterized by time T2.oneH (proton magnetic resonance), which are present in aqueous systems and are characterized by high sensitivity. Nuclear magnetic resonance spectroscopy also uses nuclei with a nonzero magnetic moment2H (deuterons), thirteenWITH, 17O, 15N, 29Si, 31P, etc.

# NMR studies of aqueous solutions of homeopathic remedies spectroscopy

In accordance with the theory of solitons of A.S. Davydov, the formation of structures in aqueous systems is determined by the transfer of protons, which made it possible to assume that there is a connection between these processes and the characteristics of bioresonance means of individual therapy and homeopathic preparations [8]. With the development of this direction, the method of NMR spectroscopy began to be widely used in further studies [9].

According to the analysis results physico-chemical research homeopathic medicines carried out before the end of 2015, NMR spectroscopy was used in 19% of studies, the applicability of other commonly used methods was in the range from 20 to 26% [10]. The results of the first analyzes of homeopathic remedies by NMR spectroscopy were rather contradictory, since in some studies there were no significant differences from the control samples, while in other experiments using the same method, significant differences were found.

Spectra oneH NMR for dilution of Sulfur D4, which was brought to D30 by potentiation, was recorded at two different frequencies of 300 and 500 MHz and compared with control samples, which were deionized water [11]. The results showed identical NMR spectra of protons at two frequencies, regardless of the dilution from D4 to D30, and statistically significant differences in the T1 relaxation times between the control samples and Sulfur D10-D30 preparations were also not found. The effect of impurities from the walls of glassware used in measurements of the T2 spin-spin relaxation time of NMR spectroscopy with low resolution was established by comparison between homeopathically potentiated and conventional solutions of nitric acid [12]. However, as the authors themselves summarize, the established artifact does not exclude that NMR spectroscopy can be a useful analytical procedure for the study of homeopathic potencies. This position is confirmed by the analysis of the applicability of the NMR spectroscopy method in the assessment of homeopathic dilutions outside Avogadro, performed by JL Demangeat and B. Poitevin, where considerable attention was paid to methodological issues, in particular the effect of impurities on the measurement results [13].

DJ Anick's experiments using oneH NMR spectroscopy of aqueous solutions of 57 samples of homeopathic medicines in various potencies from 6C to 10M and 46 control samples, also did not reveal significant differences [14]. At the same time, traces of organic molecules such as ethanol, acetate, formate, methanol and acetone were found in the samples of the preparations. Analyzing the possibilities of using NMR spectroscopy in the study of aqueous solutions prepared by homeopathic methods, DJ Anick suggested that the use of measurements with deuterons (D<sub>2</sub>O), which will significantly increase the sensitivity [15].

Measurements of times T1 and T2 at frequencies of 500 and 600 MHz at oneH NMR spectroscopy was carried out in aqueous solutions of homeopathic preparations Quartz 10C-30C (dilution 100-10-one hundred-30), Sulfur 13X-30X (dilution 10-13-10-30) and Copper sulfate 11C-30C (dilution 100-11-one hundred-30) [sixteen]. In contrast to other experiments, these analyzes applied contamination control of the test samples using inductively coupled plasma mass spectrometry. In the first series of measurements at a frequency of 600 MHz, a significant increase in the spin-lattice relaxation time T1 was observed for all samples depending on time, but there were no significant differences between the homeopathic potencies and the control (deionized water). However, a year later, in the second series of measurements at 500 MHz, a statistically significant increase in the T1 relaxation time was found for the Sulfur homeopathic preparations of all dilutions compared to the controls. It is assumed that the reason for such results is the process of leaching the glass of the vessel walls with water or a change in the dynamics of water molecules.

Supramolecular model of the structure of aqueous solutions of substances in ultrahigh dilutionsSumming up the results of twenty years of research on the molecular structure of aqueous solutions of substances in ultrahigh dilutions by proton NMR spectroscopy, JL Demangeat came to the conclusion that supramolecular structures less than 4 nm in size in solutions exist in the form of nanobubbles, which appear around the solute and remain at all dilutions up to 12C [17].

The stated hypothesis was based on a number of studies performed in which solutions of histamine in water and 0.15 M NaCl (dilutions  $5.43 \times 10$ -8 M -  $5.43 \times 10$ -48 M) [18] and Silica / Lactose in water, 0.15 M NaCl and 0.15 M LiCl (dilutions 10-7 M - 10-47 M) [19]. Samples were prepared by dilutions with vigorous stirring and under strictly controlled laboratory conditions; water and aqueous solutions of NaCl and LiCl were the same and

simultaneously prepared and used as controls. The noted changes in the relaxation times T1 and T2, which were observed in the diluted solutions as compared with the control ones, disappeared after a 10-minute cycle of heating / cooling the samples in hermetically sealed conditions. All the results obtained in these studies indicate the organized state of water in the form of stable supramolecular structures associated with nanobubbles, which nucleated around the solute during the stage of mechanical shaking (dynamization) of solutions and destroyed after heating.

The supramolecular structure of water was also investigated in other experiments in which the times T1 and T2 were measured using proton NMR spectroscopy at frequencies from 200 to 500 MHz in different water samples: distilled, spring and water treated with electromagnetic fields, and with homeopathic dilutions [ twenty]. Particular attention in these measurements was paid to the purity of the experiments: all samples were deoxygenated, and contamination of solution samples with paramagnetic impurities was prevented. In all water samples, a two to threefold increase in the value of the spin-lattice relaxation T1 in comparison with the spin-spin T2 was found, which made it possible to propose a model of the supramolecular structure of water. Supposed,

The existence of surface and bulk nanobubbles in water has been discovered and studied in physicochemical studies, irrespective of high and homeopathic dilutions [22]. The presence of nanobubbles in water, recorded by proton NMR spectroscopy, is the cause of changes in the physical properties of water, which can stimulate biological activity [23]. In his recent analytical reviews of his own studies on NMR spectroscopy and published literature data, JL Demangeat once again confirmed the role of nanostructures that were formed in high dilution solutions as a result of the nucleation of nanobubbles around the solute molecule during dynamization [24]. Formed structures, acting on organ receptors through ligand-receptor interactions,

The effect of low-frequency pulsed electromagnetic fields in the frequency range from 10 to 500 Hz on nanobubbles present in water was detected using nephelometry at a wavelength of 488 nm [25]. Samples of ordinary and degassed water placed in a solenoid, preliminarily purified by membrane filtration, were exposed to alternating magnetic fields with an intensity of about 1 mT for 6 hours at a controlled temperature. Immediately after the electromagnetic effect, a more than 20% decrease in the maximum light scattering intensity was observed, and in both water samples. However, on the 12th day after exposure to the magnetic field, changes in light scattering were observed only in samples of non-degassed water. It is assumed that the origin of the observed effect is associated with gas bubbles with an average diameter of about 300 nm present in water, which are influenced by a low-frequency electromagnetic field.

The dissolved nanobubbles present in water are considered as the primairy target of the biological action of low-intensity electromagnetic fields [26]. This hypothesis is supported by the observed changes in the electrical conductivity of water, when the number of nanobubbles from air dissolved in water decreases as a result of electromagnetic action, which, as a result, leads to an increase in the conductivity of water.

Experiments by V. Elia et. al, which established the ability of two aqueous solutions of carbon nanoparticles (fullerenes and nanotubes) with high dilutions to transmit at a distance through electromagnetic fields changes in their supramolecular structure [27]. Nanoparticles in dilutions of 5; 7; 9; 12 and 30CH were prepared in an aqueous solution of MgCl<sub>2</sub> with dynamization (100 vertical mechanical shaking for 12 s). All experiments were carried out on 900 2 ml vials filled with solutions of 0.25 ml of nanoparticles or double distilled water. Vials with dilutions of nanoparticles and distilled water were placed at a distance of 0.5 cm from each other. Changes in both samples were monitored throughout the experiment (541 days) by determining the specific electrical conductivity by conductometric method. As a result, a clear linear correlation was established between the conductivity of both samples, which confirms the assumption about the ability to transmit changes in the structure of water through electromagnetic fields through the formation of nanostructures.

Experimental studies of individual therapy means, obtained by bioresonance methods

In a series of studies carried out by the Institute of General and Inorganic Chemistry. N.S. Kurnakov RAS and the staff of the IMEDIS Center, by NMR spectroscopy, the possibility of electromagnetic transfer of the properties of homeopathic preparations to 0.9% aqueous NaCl solution was studied using the IMEDIS-BRT-A apparatus (CIMS IMEDIS LLC, Russia) in the Transfer".

The studies were carried out on an NMR spectrometer Bruker "AVANCE-300" (Bruker Biospin, Germany) at a frequency of 46.08 MHz at a magnetic field strength of the spectrometer of 7.05 T according to the standard single-pulse program [28, 29]. The transfer of the properties of the homeopathic preparation Sulfur in potency D30 was carried out on an ampoule with saline for 2 minutes. Highresolution NMR spectra (396 spectra from 198 samples) were recorded on nucleioneH, 17Oh and 2H for 1 minute.

The study showed that the most successful method for recording changes in spectra can be high-resolution spectroscopy. 2H NMR. In these measurements, the addition of heavy water (D<sub>2</sub>O, 7% by volume) to improve sensitivity. It was found

reliable influence of the transfer of properties of Sulfur D30 to physiological solution, which is expressed in a change in the electronic environment of deuterons of water molecules. It should be noted that in the control samples, the procedure for transferring the properties of the homeopathic preparation did not affect the electron density in the deuteron region. Thus, the studies carried out are strong evidence of the possibility of registering the phenomenon of transfer of the properties of homeopathic medicines to other carriers using the "IMEDIS-BRT-A" apparatus.

## CONCLUSION

An analysis of the results of using the NMR spectroscopy method in studies of the structure of water and aqueous solutions of substances in high dilutions showed the presence of supramolecular structures in solutions, which, most likely, determine the nature of their biological action. The results indicate the presence of the fact of non-contact transfer by means of electromagnetic interactions of the properties of aqueous solutions of homeopathic medicines to other carriers. The experimental results obtained using NMR spectroscopy confirm the possibility of registering changes in the carrier solution when creating bioresonance means of individual therapy, which opens up new possibilities in the practice of bioresonance therapy.

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