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Posters

1. CORTICAL OSCILLATION RELATED TO BINOCULAR VISION

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In normal humans, binocular sensitivity has been shown to be superior to monocular sensitivity. Similarly, cortical visual evoked potentials (VEPs) evoked by binocular stimulation are generally larger in amplitude than those evoked by monocular stimulation − *binocular summation or facilitation phenomenon.* Is it believed that binocular summation is the effect of binocular cells activity located in the primary visual cortex. However, the involvement of other brain areas in binocular interaction is still under debate. The aim of the study was to examine activation of the higher cortical regions in response to binocular viewing. Using multichannel EEG and time-frequency analysis, interaction between different brain areas related to binocular viewing, could be indicated.
Twelve young subjects with corrected refractive errors and no inter-ocular suppression were examined. Cortical activity was measured with 64 channels (Quick Amp). Reversed pattern checkerboard (box size 15') was presented with 1 Hz frequency. Three different visual conditions (dominant eye (DE), non dominant eye (NDE), both eyes (BE)) were tested. Wavelet analyses were performed to explore the neuronal synchronization of different brain regions.
When viewing with DE, strong activation in the area of occipital cortex and weak oscillations in the parietal and frontal regions were found in the study. NDE condition was related to significant cortical activation, but only in the occipital areas.

Binocular interaction was related to increase in τ (4 − 7Hz), α (8 − 13Hz), β (16 − 25Hz) and γ (45 − 80Hz) oscillations, in the area of whole occipital (visual), middle parietal, and middle anterior part of frontal cortex. The increase in high frequency oscillations (β, γ) when weaving with both eyes, was observed in the area of occipito-parietal cortex, but only in the early and medium processing stages. The increase in lower frequency oscillations (α) related to binocular viewing, was found in the area of occipital and parietal cortex, in early and medium time windows. Additionally, α − rhythms in the medial-frontal region occurred in the medium time window. τ-power increased in early, medium, as well as in the late phases of processing, in the area of occipital, parietal and medial-frontal cortex.

Strong cortical activity which deals with binocular viewing should not be interpreted only as binocular visual cells activity in the primary visual cortex. EEG method seems to be effective in measuring binocular interaction and maturity of brain cortex in normal, as well as in strabismic subjects.

2. TDDFT COMPUTATIONS OF THE ELECTRONIC SPECTRA OF BENZODIFURAN DERIVATIVES IN SOLVENTS

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Density Functional Theory computations of spectroscopic properties (absorption and emission spectra) of benzodifuran derivatives were performed. Several density functionals (BP, B3-LYP, CAM-B3LYP and PBE0) were tested and the results were compared with the experimental UV-Vis data. Linear response (LR) and state specific (SS) variants of the polarizable continuum model (PCM) were applied to investigate its influence on obtained results. Finally, accuracy of the results were correlated with the shape of HOMO and LUMO orbitals of the given benzodifuran derivative.

3. POWER SPECTRA CALCULATED BY MEANS OF FOURIER TRANSFORM, WAVELET TRANSFORM AND AUTOREGRESSIVE MODEL IN ANALYSIS OF ELECTROMYOGRAPHIC SIGNALS

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Electromyography (EMG) is a technique for evaluating electrical activity and properties of the muscles. It is used to diagnose many neuromuscular diseases.

The aim of this study is to preliminary analyze EMG signals by means of power spectra obtained from: classical spectral method based on Fourier

transform, method based on wavelet transform and method based on autoregressive modeling.

Spectral analysis is based on application of Fourier transform in order to decompose signals into sinusoidal components with fixed frequencies. The power spectrum yields the information about frequencies occurring in signals and the dominant frequency for these signals. For estimating the power spectrum we used Welch method.

Wavelet analysis allows to analyze simultaneously time and frequency contents of signals. It is achieved by fixing a function called mother wavelet (e.g. Morlet wavelet) and decomposing the signal into shifted and scaled versions of this function. It allows to precisely distinguish local characteristics of signals. Computing wavelet power spectrum one can obtain the information about occurring frequencies as well as when these frequencies occur.

In autoregressive model signal is represented as a linear combination of its prior samples with a prediction error. To calculate the power spectrum three steps are necessary: estimation of approximate model order (mostly by means of the Akaike information criterion), estimation of model coefficients and then estimation of the power spectrum.

Selected EMG signals were obtained from Physionet. EMG recordings came from three subjects: healthy, one with myopathy and one with neuropathy. EMG records were obtained using needle electrode placed in tibialis anterior muscle. Subjects dorsiflexed the foot against resistance and the needle electrode was repositioned until motor unit potentials with a rapid rise time were identified. EMG signals were recorded at 50 KHz, downsampled to 4 KHz and two analog filters were used: a 20 Hz high-pass filter and a 5 KHz low-pass filter.

Based on the obtained results we can determine that in healthy subject there are no peaks in the graph of the power spectrum and it decreases with the increase of frequency. In unhealthy subjects there are peaks present (e.g. approximately 200 Hz, 500 Hz), indicating additional structure in the signal.

Classical methods of signal analysis (e.g. methods based on Fourier transform) are still frequently used, because we can obtain basic information, but it seems that nonlinear methods are more adequate. So next step is to apply some of nonlinear methods (e.g. DFA method, Poincaré plot) to larger groups of subjects.

4. DEACTIVVATING MYOFASCIAL TRIGGER POINTS APPLYING STATIC MAGNETIC FIELD

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Myofascial pain syndrome is defined as sensory, motor and autonomic disorder caused by the occurrence of trigger points *(TrP).* TrPs are highly irritable spots within hypertonic tissues, which under pressure manifest themselves through radiating or referred pain. Their etiology is multiple.

In literature both Polish and foreign a shortage of reports on the possibilities of deactivating TrPs through exposure to static magnetic field can be noticed. Hence the aim of current research is an attempt at answering the question whether static magnetic field can change the activity of TrPs.

The influence of static magnetic fields on living organisms results from influence of the field on uncompensated electron spins, diamagnetic molecules and moving electric charges. The most important influence is direct analgetic action to remove pain. The analgetic action lasts even after a therapy is finished. 16 volunteers in age from 20 years old up to 30 years old were tested. All of them had manually identified myofascial trigger points. The whole group was tested with use of the static magnetic fields (MagneticUnit discs). Preliminary research results proves high effectiveness of the influence of static magnetic fields on myofascial trigger points.

5. EFFECTS OF MAGNETOSTIMULATION ON HEMOREOLOGICAL PROPERTIES IN PATIENTS WITH BACKPAIN

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Magnetostimulation is one of the techniques used in physiotherapy [1]. Hemorheology deals with phenomena accompanying blood flow in vessels and analysis of the processes accompanying this flow: red cells aggregation and deformation [2, 3]. The aim of current studies was to evaluate the effect of magnetostimulation on hemorheological properties in patients with back pain. Blood samples from 5 patients

suffering from strong back pain were taken before and aftera series of 5 magnetostimulation sessions performed by means of the large applicator of the Viofor JPS instrument using the M1P2 program of intensity "2". For each blood sample the flow curve was measured in the range of shear rates γ' from 100 to 0.01 (descending order) in a 5 minute period by means of the rotary-oscillatory rheometer Contraves LS40. Apart from that oscillatory measurements were applied to obtain the complex blood viscosity η* with its components: viscous η' and elastic η'' at constant frequency f = 0.5 Hz in a decreasing order of shear amplitude γ'_0. Plasma viscosity was calculated from a linear fit to its flow curve.. For each blood sample the hematocrit value was measured using the standard method. All patients donated blood twice: before the therapy and after 5 sessions of stimulations with variable magnetic field of low frequency. The rotary measurement results were analyzed by means of rheological Quemada model in order to quantify red cells aggregability and deformability [3, 4]. The following parameters were compared: hematocrit value, plasma viscosity, whole blood viscosity at four chosen shear rates, Quemada model parameters: k_0 (measure of red cells aggregability), k_∞ (measure of red cells stiffness) and γ'_c (measure of red cells tendency to aggregate), as well as the components of the complex viscosity η*: viscous (η') and elastic (η''). As a result of magnetostimulation the following changes were found: decrease of the whole blood viscosity, decrease of plasma viscosity, decrease of red cells aggregability and improvement of red cells deformability. Evaluation of the oscillatory measurements data indicates a decrease of both elastic and viscous component of the complex blood viscosity. More accurate quantitative analysis would require a larger group of patients.

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6. AUTOIMMUNE ILLNESSES IN THE MORA kHz RESONANCE DIAGNOSTICS

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Autoimmune illnesses are the set of chronic illnesses that cause significant medical, economical, sociological and psychological problems. The patients suffer from the symptoms of the illness for many years. The factors initiating the illness are as a rule not known. The treatment of autoimmune illnesses is long-lasting and expensive.

The MORA-bioresonance diagnostic method was developed by Franz Morrel and Erich Rasche. They have built the commercial device MORA (Med-Tronic GmbH, EN ISO 13485, EN ISO 9001). The idea of the method is the registering of the signals in the frequency range 1 − 100kHz that are emitted by different vitamins, trace elements, toxins, pathogens or tissues by using very sensitive AD-card. These signals are characterized by the increase in the impedance of about 10% − 30% if they are transmitted through the human body and the given pathology exists in the organism. The human body can be treated as the frequency-specific filter for the applied signal. The impedance increase of the tissue is observed only up to the given amplification of the applied signal. The highest amplification of the given signal being successively damped by the body points to the amount of energy, the body is able to absorb. It makes it possible to conclude about the intensity of the given process in the body. The possible mechanism of the spectrum-specific absorption can be explained by using the Quantum Field Theory applied to the structure of the water. The very high coincidence between the frequencies of the rotation of free quasi-excited electrons in the coherent domains of the water and the frequencies being used in the MORA diagnostics is observed. These frequencies lie in the proximity of f = 7kHz i (i = 1, 3, 5, 7,…). 843 patients suffering from different symptoms were examined using MORA-bioresonance diagnostic test in years 2008 − 2013. The signal 'autoimmune illnesses' has resonated at 190 of them. 66 of them were diagnosed by academic medicine to have a given autoimmune illness. Remaining 124 patients possessed different non-specific symptoms which did not fulfill the diagnostic criteria for the given autoimmune illness.

The following conclusions were drawn based on the statistical analysis: Energy deficiency in the cell and oxidative stress are strongly involved in the autoimmune pathology. Antioxidants' deficiency (vit. E, Mn, Zn, Fe, Se, Cystein, Glutamine, Glutathione) are common in the chronic autoimmune patients. Fungosis and wheat gluten are especially involved in intestine dysbiosis generation followed by malabsorption of important nutrients. Cellular defense

system is often deteriorated. The deficiency of folic acid and Vit. B12, necessary for cell division, is often met. Egg white, gluten of barley, milk, oat and rye are the often allergens. Co-Infections (fungosis, borreliosis, EBV, Cytomegalie, parasites) are often met at autoimmune patients. Many trace elements, vitamins and amino acids are deficient. Low-level toxin charge (e.g. Lindan, Pyrethrum, Lead, Arsenic, Mercury, PCB, Polyaromated hydrocarbons, Xyladecor), chronic extracellular acidosis, putrefactive and fermentative processes in the intestine, accompany autoimmune illnesses. Latent autoimmune pathology is often involved in the occurrence of different non-specific symptoms.

7. PROCEDURE FOR THE KREBS CYCLE METABOLISM PROFILING IN CANCERS USING MORA-kHz RESONANCE DIAGNOSTICS

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Since the decreased activity of tricarboxylic acid cycle (TCA) enzymes and the oxidative phosphorylation cytochrome chain (OXPHOS) have been found in the specific types of cancers, the profiling of the cancer metabolism can bring valuable information concerning the treatment of the cancer.

The new method for the profiling of the cancer metabolism is proposed that is based on the Mora-kHz diagnostic tool. The human body can be treated as the frequency-specific filter for the applied signal. The impedance increase of the tissue is observed only up to the given amplification of the applied signal. The highest amplification of the given signal being damped by the body points to the amount of energy, the body is able to absorb.

The idea of the presented method is to amplify the kHz signals generated by TCA metabolites and to conduct these signals through the human body. These signals are postulated to be characterized by the increase in the impedance of about 10% − 30% if the amount of the given TCA metabolite is in the imbalance. Additionally, the signals of TCA ampoules can be mixed with signal from the Mora-diagnostic test representing the given kind of tumor or given kind of cell degeneration. The modification of the amplification of the mixed signal when compared to the amplifications of the individual ones can probably point to the lack or overdose of the given TCA metabolite in the cancer cell.

The following elementary kinds of signal interaction are observed:

- both the TCA metabolite, tumor signal and their mixture resonate. The amplification of the mixed signal is approximately equal to the sum of amplifications of the individual signals. This situation corresponds to the lack of interference between TCA metabolite and tumor. The amount of the given TCA metabolite is probably increased in the cancer and/or in the healthy cells.
- both the TCA metabolite and tumor signal resonate, but their mixture does not. This situation corresponds to the significant interference between the TCA metabolite signal and tumor signal. The TCA metabolite signal possesses the normalizing influence on the tumor signal, suggesting the insufficient amount of the given metabolite in the cancer cells.
- The resonance of the mixture of signals vanishes only up to the amplification that is smaller than the amplification of the tumor signal. This situation corresponds to the partial interference between the TCA metabolite signal and tumor signal. The TCA metabolite signal possesses the partial normalizing influence on the tumor signal.
- The TCA metabolite does not resonate but it possesses the some normalizing effect on the tumor signal. This situation corresponds probably to the normal concentration of the given TCA metabolite in the cancer cell, its application can, however, probably modify the cancer cell metabolism.

Thus, the procedure of the cancer metabolism profiling must consist of 3 steps:

- searching for the most strongly resonating tumor signal;
- determining the amplification of the individual TCA metabolites;
- determining the resonance profile of the mixed signals consisting of the individual TCA metabolite and the tumor signal;

The suggested insufficient or overdosed amount of the successive TCA metabolites can point to activity of the individual TCA enzymes. The results obtained using presented method must be compared with other methods estimating the amount of the TCA metabolites in the cancer cell.

8. MAGNETIC LABELING OF CELLS AND BIOMOLECULES. MAGNETIC CARRIERS

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Magnetobiology is a new multidisciplinary domain with contributions coming from fields as diverse as physics and medicine. Its mainstay, however, is biophysics [1]. There is still no magnetobiological theory, or rather its general physical treatments, or predictive theoretical models. A low-frequency magnetic field permeates a living matter without any

apparent hindrances. It affects all the particles of the tissue, but not all of the particles are involved in the process of the transferring of information about the magnetic field to the biological level. Primary processes of the interaction of a magnetic field with matter particles, such as electrons, atoms, and molecules, are purely physical processes. Charged particles of living matter, ions, that take part in biophysical and biochemical processes seem to be intermediaries in the transfer of magnetic field signals to the next biochemical level.

Magnetic labeling of cells and biomolecules can be accomplished with the use of magnetic carriers, henceforth referred to as MPs [2]. Magnetic labeling has found extensive application in life science research, clinical diagnostics, and therapeutics. Most MPs are based on inorganic magnetic materials, primarily iron oxides. For their use in biotechnology, these MPs are either coated with or embedded into matrix materials such as polymers and silica and are then typically referred to as composite particles. Most applications utilize composite magnetic nano- or microparticles with sizes between 50 nm and 10 μm, although even very large MPs that are 800 μm in diameter have been used for the magnetic separation of α-amylases from porcine pancreas, starch-degrading enzymes, and wheat germ [3].

In this theoretical study a prototypical model accounting for magnetic field effects in enzyme reactions is discussed (Fig.1). Magnetic field influence is exerted on the recombination probability of a transient radical pair that is generated within the enzyme reaction cycle.

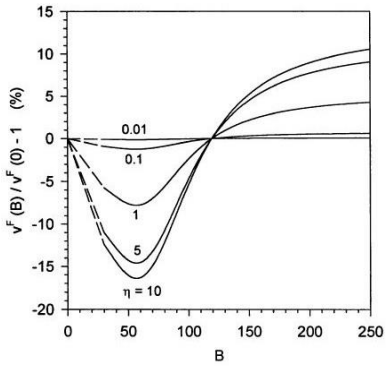

Fig. 1. Magnetic field effect on the enzyme reaction rate, v^F – function of magnetic induction (in percent) [%], B – magnetic induction (in milliTesla) [mT].

The magnetic components include inorganic magnetic materials such as the iron oxides magnetite Fe_3O_4, maghemite $\gamma - Fe_2O_3$, and mixtures thereof. Metallic iron, cobalt, nickel, and alloys thereof can also be used [4 − 6]. Lorentz force (F) generated as a result of the exposure to Constant Magnetic Fields caused electrolyte movements. The Nernst diffusion layer δ_D was depleted, while a new Navier-Stokes hydrodynamic layer δ_H appeared (Fig. 2).

The presented considerations concerned obviously the flat surface of the working electrode, and the Constant Magnetic Fields was parallel to the working electrode surface.

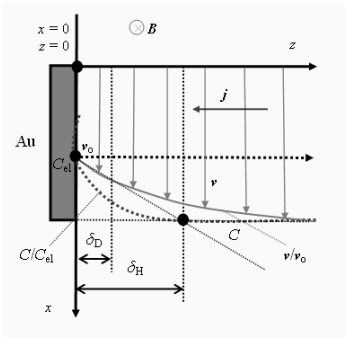

Fig. 2. Reduction in the Nernst diffusion layer thickness δ_D near the working electrode surface under the influence of Constant Magnetic Field, and formation of the Navier-Stokes hydrodynamic layer δ_H.

In addition to size, structure, magnetic moment and magnetic properties, the most important parameters are surface charge, surface hydrophobicity and hydrophilicity, porosity, and the type and density of reacting surface groups [2]. Chemically reactive groups on the surface are used for covalent immobilization of affinity ligands and target biomolecules.

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9. EFFECT OF THE VARIABLE MAGNETIC FIELD, PULSED RED LIGHT AND THEIR COMBINATION ON REACTIVE OXYGEN SPECIES PRODUCTION BY NEUTROPHILES IN VITRO

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The aim of this study was to investigate the effect of the pulsed red light (630 nm), variable magnetic field of ELF range and their combination on reactive oxygen species (ROS) production by neutrophiles *in vitro*. Neutrophils are phagocyte cells. Their basic function is the destruction of phagocytised microorganisms by using one of intercellular mechanisms called respiratory burst. The mechanism of the respiratory burst consists of tenfold increase in the consumption of oxygen, as well as in the production and release of large quantities of superoxide radical anion (O_2^-) outside the cell. Dismutation of this radical results in the hydrogen peroxide which was the object of interest of this research. Detection of the H_2O_2 was made by the analysis of fluorescence of DCFH-DA (2'7'-dichlorofluorescin diacetate) probe via the flow cytometry. The fluorescent dye diffuses into the cell and is converted in the presence of e.g. H_2O_2 to the DCF (2'7'-dichlorofluorescin). The intensity of DCF fluorescence refers to the quantity of produced hydrogen peroxide. The respiratory burst was induced with PMA (phorbol 12-myristate 13-acetate).

Blood from healthy volunteers was used for the purpose of the study (10 people for each physical factor). Lithium heparin was used as the anticoagulant. Samples were irradiated by the pulsed red light or placed in the variable magnetic field for 30 minutes. Combination of the red light and variable magnetic field was used as third factor influencing on ROS production by neutrophils in vitro.

Physiotherapy treatment device Viofor JPS was used as a generator of the red light and the variable magnetic field. The mean induction of the variable magnetic field equaled 26.7, 44.5 and 89μT. The values of densities of the red light energy were: 1.12, 1.17 and 1.19 [J/cm^2]. The fundamental frequency of pulses of magnetic field/red light was 180 ÷ 195 Hz. The pulses were administered in the form of packets of pulses (12.5 ÷ 29 Hz), groups of packages (2.8 ÷ 7.6 Hz) and series (0.08 ÷ 0.3 Hz). The form of impulses was close to the peak-shaped. M1P2 program was applied in accordance with Viofor JPS device designation, which means that the chosen intensity of the magnetic field or the red light was constant during the whole application time. We observed that the magnetic field does not cause statistically significant changes in hydrogen peroxide production by unstimulated and PMA-stimulated neutrophils. The red light caused statistically significant decrease of the respiratory burst of unstimulated and PMA-stimulated neutrophils for all used light energy densities with the exception of irradiation of PMA-stimulated cells when density of energy equalled 1.17 [J/cm^2]. The combination of the red light and the variable magnetic field caused statistically significant decrease in H_2O_2 production of neutrophils for almost all used magnetic field inductions and light energy densities. There was no synergism effect when the variable magnetic field and the red light was applied at the same time. A variety of autoimmune, inflammatory or airway diseases are mediated in some part by neutrophils (gout, rheumatoid arthritis, pleurisy, asthma etc.). Activated neutrophils are one of the main sources of ROS in the organism. The home therapy such as application of the pulsed red light or variable magnetic field combined with red light could be also used to potentially decrease of neutrophils activity contributing to the improvement of health.

10. DISPERSION OF ELECTRIC CONDUCTIVITY AND DIELECTRIC PERMITTIVITY OF PATHOLOGICALLY CHANGED VEINS (VENA SAPHENA MAGNA)

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Disorders of veins are common clinical problems, 90% of which comprise varicose veins or phlebothrombosis. Primary varicose vein wall changes take place mainly in the central membrane, which occurs to reduce the number of muscle fibers which affects the elongation and tension of the vein wall. Areas of intimal hyperplasia and smooth muscle cell proliferation are often noted in varicose veins, although regions of atrophy are also present. The total elastin content in varicose as opposed to non-varicose veins is reduced; changes in overall collagen content are uncertain. In clinical practice, to assess the venous system most widely used technique is ultrasound Doppler. Venous disease of the legs can be classified according to the severity, cause, site and specific abnormality using the CEAP classification. Use of such a classification improves the accuracy of the diagnosis.

The aim of our study was to determine the electrical properties of the vein wall for the great saphenous vein characterised as C2.

The extracted vein was divided into 6 even parts. Number one means the most proximal part of the vein. From every part the 10 mm diameter circle was

prepared and immersed in the capacitor. The single measurement was held in the fixed temperature. In the range of frequencies from 100 Hz do 5 MHz the electric conductivity dispersion is observed for all of vein parts. It indicate the linear dependence on the electric field frequency. The increase of conductivity is greatest for the fourth and smallest for the third part of vein.

All parts of vein indicate significant dispersion of dielectric permittivity ε' in the range of frequencies from 100 Hz to about 100 kHz. In this range permittivity decreases almost exponentially. The greatest changes were for the first part, the smallest for the third one.

In turn for the ε″ dispersion the greatest change was for fourth part and the smallest for the third one.

There was also the temperature dependence of electric conductivity observed. It is consider to be connected with the thermal denaturation of proteins.

At this stage of investigations it can be concluded:

- the heterogeneity of the pathological changes along the vein
- the greatest changes of electric conductivity and ε″ for the upper part of vein
- the smallest changes of above functions for the middle part of vein

The next step of investigations is to determine the dependence of electric properties on the pathological changes in veins.

11. CONFORMATIONAL STUDIES OF GAS-PHASE RIBOSE AND 2-DEOXYRIBOSE BY DENSITY FUNCTIONAL, SECOND ORDER PT AND MULTI-LEVEL METHOD CALCULATIONS: THE PYRANOSES, FURANOSES AND OPEN-CHAIN STRUCTURES

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We present an extensive computational study of a complex conformational isomerism of two gas phase C5 sugars of biological and astrobiological importance, D − ribose and 2 − deoxy − D − ribose. Both cyclic and open-chain isomers have been probed using M06 − 2X density functional, second order Møller-Plesset perturbation theory (MP2) and multi-level G4 methods. This study revealed a multitude of existing conformers. In agreement with the recent gas-phase microwave (MW) investigation of Cocinero et al., the calculated free ribose isomers of lowest energy are two β − pyranoses with the $^{1}C_{4}$ and $^{4}C_{1}$ ring chair conformations. Both β − pyranoses which feature cooperative systems of three intramolecular O-H···O hydrogen bonds lie within 0.9 kJ/mol in terms of ΔG(298K)(G4), thus challenge the theoretical methods used to predict the ribose global minimum. The calculated most favored ribofuranose, put 10.4 kJ/mol higher in ΔG than the global minimum, is the α − anomer with the C2 − endo ring conformation and cooperative arrangement of three intramolecular H − bonds. By contrast with D − ribose, the lowest energy 2 − deoxy − D − ribose is the α − pyranose, featuring the $^{1}C_{4}$ ring chair and two intramolecular H − bonds, with the most stable furanose (the α-anomer) being only 6.2 kJ/mol higher in free energy. Our results show that maximization of intramolecular H − bonding is the major factor determining the most stable cyclic conformers. For both C5 sugars, the open − chain isomers are significantly higher in energy than the cyclic forms. The NBO analysis of the anomeric effect is consistent with the associated stabilization of not only the most favored pyranoses but also lowest-lying furanoses. A good overall agreement is observed between the M06-2X/6-311++G(d,p) and MP2/6-311++G(d,p) calculated structures.

12. THE MODYFICATION OF APPARATUS FOR TASTE EXAMINATION

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Since 1958, when Krarup published his first basic paper on the use of galvanic current for qualitative examination of taste, many apparatuses have been constructed [3]. The first Polish apparatus of the type , called electrogustometer, was built in Poznan Clinic of Otolaryngology at the beginning of 1960 and the first research results were published by Pruszewicz et al in 1964 [1]. Batteries of various voltage (4, 5 up to 100 V) constitute the source of electrical current in such apparatus, the measuring tool is a micro ammeter and the set of large resistors in the circuit for examining the taste decreases the resistance of human body to a negligible value therefore this resistance does not have any significant influence on the results obtained. The amperage needed to evoke the sensation of taste is expressed in μA, in electric gust units (According to Krarup) or on a logarithmic scale in dB (Tomita, Rollin). The time of stimulation should be from 0.5 to 1 second. When the stimulation is longer or shorter, the threshold of taste elevates. In order to verify the results one might also examine the sensitivity threshold of the trigeminal nerve by placing the electrode in the central line, about 2.5 cm from the tip

of the tongue. The threshold values of the latter stimulation are age dependent and in healthy people the values may vary from 15 to 120μA. The differences between left and right half of the tongue which exceed 20 μA are considered to be pathological [1].

It seems that the effect of pH on the surface of the tongue causes inaccurate results of the analysis of taste by means of electrogustometer.

AIM: The aim of the work was to assess the effect of pH on the surface of the tongue on the changes of thresholds of sense of taste measured by means of electrogustometer established by Pruszewicz in compare to modified self constructed electronic apparatus [1, 2, 3, 4].

MATERIAL AND METHODS

Five patients whose sense of taste remained within the norm (established by Pruszewicz) participated in the experiment. The thresholds of taste sensation were measured by electrogustometer and by self constructed electronic apparatus. The scope of obtained pH on the tongue remained between 4 and 7.5. For the pH measurements, the indicator strips pH 1 – 10 were used. In order to create the proper acid pH on the surface of the tongue, the patients washed their mouths with citric acid and Coca Cola, whereas in order to achieve a more basic pH bicarbonate of soda and Listerine – the mouth rinsing were used.

RESULTS AND CONCLUSIONS

Increasing and decreasing (in compare to physiological level) pH strongly influences the threshold of taste which is higher in both cases. This tendency is particularly visible by comparing the thresholds of taste measured by self constructed electronic apparatus because of significant lower standard deviation of results.

The new electronic method developed for stimulating receptors in the area of surface of the tong allows for the registration of gustatory core potentials.

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13. A QUANTITATIVE ANALYSIS OF THE FREQUENCY SPECRTUM OF THE RADIATION EMITTED BY CYTOCHROME OXIDASE ENZYMES

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A physical model is proposed which provides a quantitative analysis of the energy emitted by proton flows through mitochondrial walls. The model developed is based on biochemical and biophysical properties of the enzyme cytochrome oxidase and in particular the embedded heme groups that are involved in the electron ferrying mechanism. The estimates of the energies at approximately 1.1eV and corresponding wavelengths of the near infra-red radiation generated, with a peak close to 900 nm, agree extremely well with experimental values. The basic idea in the mechanism proposed is that the passage of a proton through the mitochondrial wall's gate is linked with the creation of a virtual proton-electron pair in an excited state of a hydrogen atom. The electron is temporarily removed from the enzyme when the proton arrives at the gate and is subsequently deposited back at the enzyme's acceptor site when the proton leaves the gate. This model provides a partial explanation of a series of experiments conducted by G. Albrecht Buehler and elucidates the origin of biophotons.

14. CLINICAL, NEUROPATHOLOGICAL AND MOLECULAR EFFECTS OF MACROTUBULE-ASSOCIATED TAN PROTEIN (MAPT) GENE MUTATIONS (N279K, P301L AND T>C3'E10+11) RESPONSIBLE FOR FRONTOTEMPORAL DEMENTIA AND PARKINSON LINKED TO CHROMOSOME 17 (FTDP-17)

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FTDP-17 is a tauopathy, a neurodegenerative disorder associated with dementia and caused by an aberrant metabolism of Macrotubule– Associated Tau Protein (MAPT) which is involved into intracellular transport along neuronal axon. To date, over 50 pathogenic mutations in the *MAPT* gene responsible for FTDP –

17 have been identified. Different mutations have multiple effects on the biology and function of the MAPT.

To contribute to our knowledge about *MAPT* gene mutations in etiology of FTDP-17 and to estimate a link between their localization within the gene and clinical phenotype/severity of disease course, we screened for *MAPT* gene mutations in a cohort of 7 patients with autosomal dominant FTDP-17. Genomic DNA was isolated from samples of frozen brain tissues. A PCR-SSCP method with subsequent DNA sequencing was applied. An exon-trapping analysis was performed to evaluate molecular effects molecular effects of mutations. The three following *MAPT* gene mutations: N279K, P301L and T>C 3'E10+11were found. The mutations were localized in different regions of the exon 10: N279K mutation at the 5'end of the exon 10, P301L mutation at the 3'end of exon 10, and T>C 3'E10+11 mutation in a stem loop in the 3' intron of exon 10. In exon-trapping analysis, all mutations caused an increase in the production of transcripts containing exon 10 of the *MAPT* gene. They influenced on a regulation of an alternative splicing process of the exon 10. But there were differences in a proportion of 3Rtau and 4Rtau isoforms (leading to formation of tau filaments/ aggregates in brain). Moreover, the mutations determined a various age of onset (44 – 59 y.) and duration (6 – 16 y.) of the disease. A spectrum of clinical symptoms (phenotypes) and neuropathogical hallmarks was observed among carriers of the particular mutations. Clinical, neuropathological and molecular effects of N279K, P301L and T>C 3'E10+11 mutations are varied and seem to be dependent on both their localization within *MAPT* gene and other still fully unknown factors.

15. MAGNETOELECTROCHEMICAL INVESTIGATION OF CYCLIC VOLTAMMETRY OF L – CYSTEINE. MAGNETIC SEPARATION

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Electromagnetic fields (EMF) are known to cause biological effects within a wide range of amplitudes, frequencies, etc. For instance, sufficiently intensive EMFs engender conduction currents, heat biological tissues, and cause rotations of molecular dipoles [1, 2]. They give rise to noticeable shifts in many reactions and spectacular biological effects. Thermal and electrochemical effects are widely used in practice, including in medicine: UVF treatments, electrophoresis, and so on.

Electrochemical means of cyclic voltammetry (CV) have been performed to characterize the SAMs (Self-Assembled Monolayers). Based on careful electrochemical analysis of CVs, it was found that L − cysteine performed the better electrochemical response at 8 h (Fig. 1). The magnetic induction (B) applied during measurements ranged from 0 to 1,2 T, and the magnetic induction vector was parallel to the surface of the working (gold, disk) electrode [3]. Lorentz magnetic forces (F) under the experimental conditions resulted in the motion of the electrolyte being tangential to the working electrode surface and perpendicular to the magnetic induction vector (B) (Fig. 2). A laminar and unidirectional (x − direction) flow of electrolyte was assumed. A Navier-Stokes hydrodynamic layer (δ_H) was formed, resulting in a reduction in the diffusion layer (δ_D).

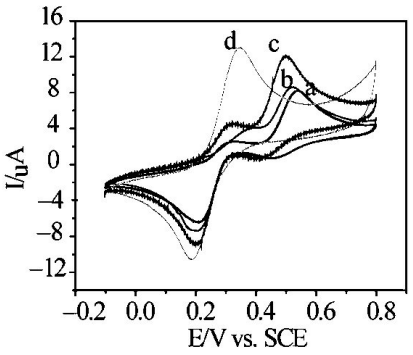

Fig. 1. Showed CV for 1mM $K_3Fe(CN)_6$ containing 0,1M KCl at a) a clean Au electrode; b) A Au electrode modified with nano-A; c) L – cysteine self-assembled to the nano-Au electrode; d) L – cysteine SAM to the nano-Au in B= 1000mT.

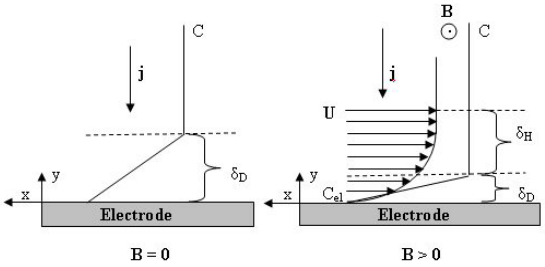

Fig. 2. Reduction in the Nernst diffusion layer thickness (δ_D) near the working electrode surface under the influence of a Constant Magnetic Field, and formation of the Navier-Stokes hydrodynamic layer (δ_H) where: C – concentration of electroactive ions in the body of the electrotyle; C_{el} – concentration near the working electrode; x, y – direction.

Magnetic separations have been used in various areas such as molecular biology, biochemistry, immunochemistry, enzymology, analytical chemistry, and environmental chemistry [2, 4]. Magnetic separations with Magnetic particles (MPs) have also been successfully studied for a wide variety of applications such as the detoxification of bloodborne toxins of humans [5], the separation of pathogenic

bacteria from food and environmental samples [6]. Simple magnet blocks in these holders typically generate field gradients in the order of 1 − 6 T/m across the diameter of standard 15-50 ml laboratory test tubes with wall thicknesses of 1-2 mm. The magnetic force (F) acting on a pointlike magnetic dipole moment (m) is described by the formula: $F = m\nabla|B|$ where the total magnetic dipole moment of the MPs is the result of volume magnetization of the magnetic component included in the MPs, (M): $m = V_m M$ and where (V_m) is the total volume of the magnetic material in the MPs.

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