

Nanochemistry and biotechnology

Erythrocytes' permittivity for determination of sensitization to local anesthetics of amide and ether groups

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Development and dissemination of accurate measurements and express-diagnostic methods (including drug disease) into clinical conditions is urgent question for up-to-date medical biotechnology. The work presents results of experimental investigations of erythrocytes' permittivity to the influence of local anesthetics amide and ether groups, since unclarity of the mechanisms of action of these drugs on molecular and cellular level remain and also serious allergic reactions in dentistry are observed. EHF-dielectrometry (K-band, 37,5 GHz) in contrast to traditional biochemical and immunoenzyme test-systems ensures rapid analysis of real part of erythrocytes' permittivity (ϵ') which determine of definite molecules' polarizability in external alternating electric field.

The local anesthetics amide and ether groups are relatively hydrophobic molecules which block Na channel by means of activation of definite binding site of transmembrane TRPV1 channels. We have supposed that anesthetics' conformational organization over polarizability of theirs lipophilic aromatic groups and hydrophilic amides determines the hydration environment on cells structures. The procaine's effectiveness ensure by polarizability both C₂H₅ groups of diethylaminoethyl ether ($\mu=1,17$ dB) and polar NH₂ groups of para-aminobenzoic acid ($\mu=1,31$ dB). In our experiment we observe the decrease ϵ' in erythrocytes' suspension at action procaine (c=500mcg/ml) concerning control samples. The lidocaine's action (c=500mcg/ml) results in more marked decrease ϵ' in erythrocytes' structures concerning procaine's action possibly due to additional hydrating of organic molecule with amide bond. At the same time, the more expressed sensitization to lidocaine agrees with experimental results concerning erythrocytes' sedimentation at the presence of amide anesthetic.

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