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ПОБУДОВА ПРОТОТИПУ ЕКСПЕРТНОЇ СИСТЕМИ
ДЛЯ ДОСЛІДЖЕННЯ НЕЙРОТОКСИКАЦІЇ ЛЮДИНИ
МЕТОДОМ ЕЛЕКТРОРЕТИНОГРАФІЇ

Bohdan Yavorskyy, Roman Tkachuk
CONSTRUCTION OF THE PROTOTYPE OF EXPERT SYSTEM
FOR RESEARCH OF NEYROTOXICITY OF THE HUMAN
BY ELECTRORETINOGRAPHY METHOD

For detection, identification and determination of a dose of neyrotoxicity of a human organism by nanoparticles (NP) electrophysiological *non-invasive* methods are perspective, exceptionally, the electroretinography. In connection with use of reaction on an irritation light of a retina of eyes are close to a brain and the nervous systems this method does possible estimation of neyrotoxicity of the organism in a real time, *in vivo*, in its initial stage. There are the international standards regulating methods of selection the electroretinosignal (ERS), its preliminary processing, ADC, optimum processing and registration, and estimation of morphological parameters (time intervals, amplitudes, etc.) of received electroretinogram (ERG) and diagnosing of pathologies of the visual analyzer. However, the application of ERG - researches for detection of NP, their identification and determination of the dose in a human organism with predicted reliability investigated insufficiently.

In the given work are presented the medico- technical requirements are led to construction of a prototype of electroretinography expert system (ERGES) for increasing of efficiency of researches of neyrotoxicity. The prototype of the ERGES is the expert system under construction at the initial stage of its developing out. It based on results of identification of researches of NP-neyrotoxicity of a human organism. The basic conceptual principles of its construction are established. Concepts are received were formalized within the limits of well-founded ERS mathematical model. Results of formalisation have made possible synthesis of structure ERGES and its realisation by hardware and software. Criteria and methods founded for an optimum choice of power as well as space-time and frequency characteristics of irritation of retina, constructions and controls of parameters and a design of electrodes for selection of ERS, optimisation of characteristics and selection of ADC of the ERG parameters, adaptations of optimal estimator of the ERG.

The ERG- system (ERGS) with automated and interactive modes and artificial intellect features is constructed. Kalman filter applies for optimum allocation and estimation of segments of the ERG. Its complexity is smaller than complexity of filters of Kolmogorov - Wiener or North- Middleton- Vleek and the filters received by approximation of their characteristics by orthogonal polynoms, harmonics functions, a method of a moving average etc. This distinction especially at increasing of requirements to reliability of detection and identification neyrotoxicity an organism, resolution and accuracy of definition of its dose showed.

A set of characteristics of probability of right estimation of ERG versus average of its full dispersion of spectral power density at different probabilities of a fault estimation received. The threshold statistics estimated at given value of the fault probabilities. Possibility of construction of the knowledge base about NP – toxicities obtained as well.