ENVIRONMENT AND HUMAN HEALTH

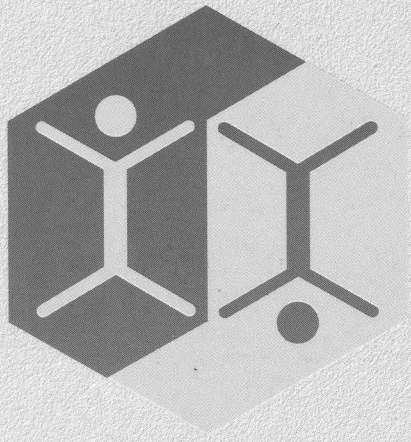

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IMAGE ANALYSIS OF CHROMATIN IN PERIPHERAL BLOOD LYMPHOCYTES AND NEUTROPHIL AT THE ATHEROSCLEROSIS PATIENTS

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The prior investigations have shown the increase of thrombosis risk in atherosclerosis in patients, chronically affected by low-level radiation [1]. This was related to platelet hemostasis activation, hypercoagulable state, hemorheologic abnormalities (lower red blood cells flexibility, higher aggregation and increase of whole blood and/or plasma viscosity at high and low shear rates). These hemostaseologic and rheologic features were independent from atherosclerotic localization (ischemic heart and brain diseases), reflected the systemic character of atherosclerotic process [3].

Moreover, the granulocytes functional abnormalities resulted in the functional response features: the active cells appearance in circulation with spontaneous releasing of lysosomal

content and depletion of secretory response at coagulation and fibrinolysis *in vitro*, have been found in patients, suffering from unstable angina [2]. Similar changes in patients with stable angina, chronically affected by low-level irradiation, have been detected, that is once more factor, which enables us to detect the complicated current of disease [1, 3].

Over the period of 10 years of our work it has been demonstrated that the structural analysis of chromatin allows to study both genetic and functional destructions. Until recently there was no adequate method for studying chromatin. It was impossible detect to visually changes and states in chromatin structure after various pathological and functional changes and states until the method for detecting minute structural changes in chromatin has been developed. This is exactly what our method offers by combining geometric and optical parameters. The method allows to observe the minute structural changes in chromatin, especially euchromatin and heterochromatin that were previously studied by genetics only in chromosomes. The morphodensitometric parameters describing frame of an interphase chromatin of cells, allow to estimate a morphophysioligical state of an epigenom in a nucleus of individual cells. Besides with the help of the given procedure it is possible to establish markers of various morbid conditions. All above-stated also has defined our problem: to estimate a structurally functional state of an interphase lymphocytes chromatin in patients with an atherosclerosis in comparison with control group.

Material and Methods. Object of research were 29 men with an atherosclerosis, the control group of practically healthy 10 men of 25–30 years living in Mogilev have generated a control group.

The method of morphodensitometry gives the possibility to study different cytological objects on a new quality level. Computational analysis of the TV image was performed by means of "DiaMorph" (Russia) – system combined with the microscopes "ZEISS" (Germany).

The computer image processing reveals an inside structure of the object which allows to research different type of cells on supramolecular level. Parameters of cells changes were evaluated quantitatively by measuring the optical density index, other optical, morphological, geometrical, topological parameters. The special methods of its statistical processing allow determining the most informative parameters for diagnosis of concrete pathologies. The cells images thus picked up by high resolution TV-camera and digitally stored in frame buffer of the measuring system could be reliably transformed into 3-dimensional image reconstruction.

We used a median filtration, linear median contrast, gauss transformation for analysis of topology supramolecular structure of chromatin. The chromatin network was recovered as a graphical drawing that connected maximal optical density on single vectors of TV scans. A double thickness size of the chromatin threads was taken as a scanning step interval. The chromatin network discrimination was achieved in 5 successive steps.

Results. Every component was estimated on the following parameters: (quantity of beads of a chromatin in a component, the area of beads components, the components area, perimeter of beads components, components perimeter, integrated optical density, optical density and contrast components). Besides there defined: the area of a nucleus, perimeter of a nucleus, integrated optical density of a nucleus, optical density of a nucleus, contrast of a nucleus.

Analysis of an interphase chromatin in patients with an atherosclerosis has shown, that nucleus of lymphocytes at patients with in atherosclerosis have smaller perimeter ($p < 0.05$) and optical density ($p < 0.05$). Differences were found in patients of the basic group in heterochromatin areas of nucleus of lymphocytes: decrease of granular components dispersity, but increase of its contrast; decrease of the general area and perimeter of perigranular zone. Changes of the parameters describing a state of perigranular zone, is

a marker of structurally functional rearrangements of a chromatin of the lymphocytes connected with in atherosclerosis.

The decrease of the general area a perimeter of perigranular zone is marked in neutrophils of the basic group patients, and content of an euchromatin (on 17.72%) at the same time has considerably been increased. The euchromatin became less dense and less dispersed. The area and perimeter of cell nucleus in basic group patients have increased; optical density of nucleus has decreased. These changes testify to the inflammatory nature of an atherosclerosis.

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