

The study of the cell membrane of blood lymphocytes in patients with diabetes mellitus using atomic force microscopy

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Atomic Force Microscopy (AFM) is a nanotechnological study method of cell membranes and makes it possible to study the structural changes in the cell membranes of living human blood lymphocytes. With using AFM, we studied Young's modulus, adhesion strength and roughness of the cytoplasmic membrane of living blood lymphocytes in patients with diabetes. Peripheral blood lymphocytes of patients with insulin-dependent and non-insulin dependent diabetes mellitus and healthy donors was analyzed using a scanning probe microscope. The scanning of the cell surface membrane of blood lymphocytes were performed using silicon probes with a hardness of 0.06 N/m, and with the radius of curvature of 10 nm. The results of studies have shown that diabetes is a significant increase of Young's modulus of membrane of blood lymphocyte as compared with that in blood lymphocytes in healthy persons. Also significant differences are in the adhesion properties and surface topography of lymphocytes in different types of diabetes. In patients with insulin-dependent diabetes mellitus, the adhesion force and values of roughness of cells is higher than that in patients with non-insulin dependent diabetes mellitus. Biophysical indicators reflect changes in the molecular structural organization of membrane lymphocytes occurring in diabetes, however, it remains unknown how these changes determine the biological activity of lymphocytes. The present study demonstrates and opens possibilities for the study of structural relationships of proteins and lipids of native cell membranes of lymphocytes, understanding the role of lymphocytes in the development of immunological disorders, occurring in this disease.

Biography

Radik Khayrullin has completed his PhD from Bashkir State Medical University (Russia) and Post-doctoral studies from First Moscow State Medical University. He is a Professor, and Head of Human Anatomy Department of Ulyanovsk State University. He has published more than 80 papers in reputed journals and has been serving as an Editorial Board Member of repute.

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