PROPERTIES OF PLASMATIC MEMBRANE OF THE CANCEROGENIC LINE OF CELLS: THE AFM ANALYSIS

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Nowadays, investigation in the cancer biology demands for new methods to provide complementary information at cellular and molecular level. The neoplasic transformation in the membrane morphology is an important indicator of the cancer progress. Morphology and nanomechanical properties of different cancer cell lines: HeLa (human cervical cancer), MCF-7 (human breast cancer) and MDA-MB-231 (human breast metastatic cancer) have been studied in great details by the atomic force microscopy (AFM). Cellular lines were cultivated directly on the flat gold film as a substrate and before visualization, samples were rinsed (dehydrated) by the ethanol-water solution, with different content of ethanol. High resolution AFM images revealed detail morphology of the cancer cell plasmatic membrane on the nanoscale-molecular level, with clear features of just a few nanometers in diameter, not seen so far. In order to understand mechanism of the nanoparticle uptake by the cancer cells, we monitor a change in the membrane surface morphology during the gold nanoparticles transfer into HeLa cells, over a period of 24 hours. The AFM analysis of the membrane surface roughness clearly show the path and dynamic of the uptake process, with maximum roughness recorded at the first 4 hours of the cell-nanoparticle interactions. In order to obtain some additional information about the cancer cell migration, motility and the invasion and progress of the metastasis process, we also probe attraction and adhesion forces on the cell surface. As expected, the metastatic cancer cells shows higher degree of the adhesion towards the AFM tip, than non-metastatic cells. We also found that higher adhesion is related to the higher degree of the membrane surface roughness. The obtained findings could be useful for a new field of nanomedicine.