

gastric cancer cells. *Oncol. Rep.* V. 30. P. 1878.
<https://doi.org/10.3892/or.2013.2638>

Wilcoxon F. 1945. Individual comparisons by ranking methods.
Biometrics Bulletin. V. 1. P. 80.
<https://doi.org/10.2307/3001968>

Waliszewski P. 2016. The quantitative criteria based on the fractal dimensions, entropy, and lacunarity for the spatial distribution of cancer cell nuclei enable identification of low or high aggressive prostate carcinomas. *Front. Physiol.* V. 7. P. 34.
<https://doi.org/10.3389/fphys.2016.00034>

Analysis of Nuclear-Cytoplasmic Redistribution of Actin-Binding Protein α -Actinin-4 and Signaling Protein RhoA in the Process of Replicative Senescence of Human Epicardial Adipose Tissue-Derived ADH-MSC Cell Line

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In this work, a molecular analysis of some mechanisms of the actin cytoskeleton reorganization in the process of long-term cultivation of human mesenchymal stem cells was carried out. The distribution of actin-binding protein α -actinin-4 and small GTPase RhoA in mesenchymal stem cells of the ADH-MSC line isolated from adipose tissue of an adult human was studied using immunofluorescence methods and analysis of confocal images. It was found that in the process of replicative senescence during 8–17 passages in ADH-MSC cells, the redistribution of the studied proteins from the cytoplasm to the cell nuclei occurs, which is accompanied by changes in the organization of the actin cytoskeleton. To assess the organization of the actin cytoskeleton, we used the coefficient of local connected fractal dimension (LCFD), which characterizes local disturbances in the geometry of heterogeneous geometric objects and is an indirect measure for assessing the structural integrity of such a complex geometric object as the actin cytoskeleton of spread cells. By measuring the LCFD of confocal images of cells stained with rhodamine phalloidin, changes in the structural integrity of the actin cytoskeleton during replicative senescence were quantified. It was found that from passages 8 to 11, a partial reversible disassembly of the actin cytoskeleton occurs, followed by assembly by the passage 17.

Keywords: actin cytoskeleton, local connected fractal dimension, α -actinin-4, RhoA, mesenchymal stem cells, replicative senescence