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Influence of gold nanoparticles on the fibroblast culture

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The control of toxic properties of nanoparticles is one of the important tasks, in particular gold nanoparticles (AuNPs) in high concentrations can have an inhibitory effect on living objects. While AuNPs have a stimulating action on proliferative and enzymatic activity of cells, possess antioxidant properties, and are also used for drug delivery and visualization of cells and tissues.

The aim of work was the study of the effect of AuNPs on proliferative potential and apoptotic processes of human fibroblasts culture.

Cells of HFC (human fibroblasts culture) were cultured in DMEM with 10% FBS. In order to determine the increase in the number of cells in the control and in the presence of AuNPs were counted the cells at 3, 5 and 7 days by enzymatic removal from plastic and counting the number of cells. AuNPs were prepared by citrate synthesis with the initial concentration of metal 45 μg/ml. AuNPs were injected into HFC by passive diffusion in consentrations of 1.5, 3 and 6 μg/ml.The apoptotic and necrotic processes in HFC at the presence of AuNPs with FACS Calibur were investigated. There were used Annexin V and 7-Amino-Actinomycin (dyes). Luminescent microscopy was performed in parallel (dyeing Annexin V) to determine the percentage of apoptotic cells in total. Group of comparison (control) were HFC cultured under the same conditions without AuNPs.

Analyzed index in groups with concentrations AuNPs 1.5 , 3 ta 6 μg/ml was 95.2 ± 5.1% and did not differ significantly from the control. Cell morphology during culturing with AuNPs in the investigated concentration range was not different from the control at all stages of observation. Adhered to the plastic cells had spindle shape. It has been found that a stimulating effect of AuNPs in a concentration of 6 μg/ml on proliferative capacity of cells was manifested at observation terms of 5 days (1.16 times), and 7 (1.13 times) relative to the control. Culturing of HFC in the presence of AuNPs (1.5 μg/ml) led to a tendency to decrease cell growth compared to the control at the culturing terms of 3-7 days. The data obtained by means of FACS-analysis and fluorescent microscopy suggest that AuNPs in investigated concentrations (1.5, 3 and 6 μg/ml) under culturing for 3 and 7 days did not cause the development of necrosis and apoptosis in fibroblast cells. It should be noted that in the tested concentrations AuNPs exhibit no toxic effects on HFC, are biocompatible and can be recommended for further use in the field of biotechnology research.