- **Nanochemistry and biotechnology**

Influence of gold nanoparticles on growth characteristics of mesenchymal stromal cells after cryopreservation

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Due to their distinctive features, the gold nanoparticles (AuNPs) have shown promising medical and technological applications. One among perspective areas is the use of AuNPs as a stimulating agent of reparation in damaged cells and tissues. The effect of AuNPs on growth characteristics of bone marrow mesenchymal stromal cells (MSCs) after cryopreservation was investigated.

The AuNPs were obtained by citrate synthesis with an initial metal concentration of 45 μg/ml. The average size of AuNPs was 15 nm. They were administered into cryopreserved bone marrow MSCs by a passive diffusion. The cells were incubated in nutritive medium supplemented with AuNPs in concentrations of 1.5, 3, 6, 9 μg/ml (1 hr at 37 ^{0}C). The apoptotic/necrotic processes in the cells were investigated with FACS Calibur (USA). The ability to colony formation was assessed by scoring the individual colonies composed of at least 30 cells. Proliferative characteristics were examined by MTT-test. The group of comparison (control) was MSCs without AuNPs. The results were processed with Student's t-test using Excel software.

The use of AuNPs at concentrations of 1.5 and 3 μg/ml did not influence morphological structure, did not cause the development of necrosis/apoptosis, proliferation ability and colony formation in MSCs. After 1-hr incubation in the presence of AuNPs at concentration of 6 and 9 μg/ml a decrease of clonogeneic activity, proliferation and percentage of viable cells and an increase of the number of apoptotic cells were observed compared with the control samples (without AuNPs). The dynamics of culture growth in the control and groups with AuNPs at concentrations of 1.5, 3, 6 and 9 μg/ml was similar, but it differed in a rate. After isolation of individual colonies of MSCs cultured with the addition of AuNPs at a concentration of 1.5 and 3 μg/ml and further passaging the formation of new colonies was observed. Descendants of MSC colonies cultured with the addition of low concentrations of AuNPs proliferated actively and formed a monolayer. In this application the AuNPs at concentrations of 6-9 μg/ml decreased the colony-formation activity in the further subculture.

As well the findings can find the application in the field of applied nanotechnology that expands to the stem cell biology primarily in the sphere of the creation of nutrient media.