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The application of cryopreserved fibroblasts with Au nanoparticles for the treatment of burns.

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One of the urgent tasks of cell biology is the study of the effect of stem cells on regenerative and reparative processes in damaged tissues. In world practice, many burn centers along with traditional approach to the treatment of burn wounds use modern biotechnological methods. The aim of our research was to investigate the possibility of using of cryopreserved human fibroblast culture (CrHFC) with nanoparticles of Au (AuNPs) for the treatment of experimental burns in rats.

Modeling of third-degree burns was performed on white female rats. All animals with burns were divided into 3 experimental groups: control – without treatment of wound; №1 – surface application of CrHFC; №2 – surface application of CrHFC with AuNPs (6 mg/ml per $1x10^6$ cells). The therapy was performed at the next day after burn injury. The number of CrHFC used for the therapy was $5x10^4$ viable cells per $1cm^2$ of wound surface. Application of the cells on the burn surface was carried out on methylcellulose gel. The animals were taken out from the experiment at the 21st day after treatment.

Topical application of the CrHFC separately and with AuNPs showed a stimulating effect on wound healing in comparison with the control. Namely the use of CrHFC separately had less pronounced effect compared to the CrHFC with AuNPs that was expressed in a slower healing of burn surface and moderate lymphocytic infiltration of granulation tissue. While in animals with application of the CrHFC with AuNPs almost complete wound epithelisation was observed to the determinated term. Immunofluorescent analysis indicated that the use of CrHFC with AuNPs accelerates synthetic processes in the skin and helps to restore collagen I type content in it to the 21st day after application.

The results probably related primarily to the unique structure and antimicrobial properties of AuNPs. Results of our experimental research into impact of CrHFC with AuNPs on burn regeneration give preconditions for further development of advanced bio- and nanotechnology.