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Cell-engineered construct for the regeneration of damaged articular cartilage

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The goal of the studies conducted was proof of the effectiveness of injectable biopolymer microheterogeneous collagen-containing hydrogel (BMCH) as a delivery system for the transplantation of cells and a temporary scaffold in cell-engineered construct for the regeneration of damaged articular cartilage. Compositions of IBMH were obtained from the hydrolysate of embryonic or postnatal animal tissues using technology of ultra-dispersion hydrogels with subsequent radiation crosslinking. The IBMH contains practically all high and low molecular weight components of extracellular matrix, namely, partially hydrolyzed collagen peptides, proteoglycans, and glycoproteins. A comparative analysis of the influence of a BMCH and of a BMCH with human adipose-derived mesenchymal stromal cells (hADMSCs) in a chondrogenic medium on the regeneration of hyaline cartilage of the rabbit tibia was performed on the test model of the adjuvant arthritis (female Soviet Chinchilla rabbits) with the further development into osteoarthrosis (OA) confirmed by the clinical, biochemical, and radiological trials. On Day 66 of the intra-articular introduction of a BMCH with hADMSCs into the left knee joint (n=5) it has been found, as opposed to the right joint (negative control, n=5), that it stimulates the regenerative processes of the cartilaginous tissue structure characterized by the formation of chondrocyte "columns," the emergence of isogenic groups in the intracellular matrix, and the regeneration of its structure. Upon the intra-articular introduction of a BMCH (n=5) such effects are markedly less pronounced. It can be assumed that the regenerative potential of a cell-engineered construct of articular cartilage is due to its activating effect on migration of stem cells from surrounding tissue into the damaged area with subsequent differentiation.

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