

## Two-Component Biocompatible Material for Reconstruction of Articular Hyaline Cartilage

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**Abstract :** Trauma and arthrosis, not to mention cartilage destruction in overweight and elders put hyaline cartilage lesion among the most frequent diseases of locomotor system. These problems combined with low regeneration potential of the cartilage make regeneration of articular cartilage a high-priority task of tissue engineering. Many types of matrices, the procedures of their installation and autologous chondrocyte implantation protocols were offered, but certain aspects including adhesion of the implant with surrounding cartilage/bone, prevention of the ossification and fibrosis were not resolved. Simplification and acceleration of the procedures resulting in restoration of normal cartilage are also required. We have demonstrated that human chondroblasts can be successfully cultivated at the surface of electrospun scaffolds and produce extracellular matrix components in contrast to chondroblasts grown in homogeneous hydrogels. To restore cartilage we offer to use stacks of electrospun scaffolds fixed with photopolymerized solution of prepared from gelatin and chondroitin-4-sulfate both modified by glycidyl methacrylate and non-toxic photoinitiator Darocur 2959. Scaffolds were prepared from nylon 6, polylactide-co-glicolide and their mixtures with modified gelatin. Illumination of chondroblasts in photopolymerized solution using 365 nm LED light had no effect on cell viability at compressive strength of the gel less than  $0,12$  MPa. Stacks of electrospun scaffolds provide good compressive strength and have the potential for substitution with cartilage when biodegradable scaffolds are used. Vascularization can be prevented by introduction of biostable scaffolds in the layers contacting the subchondral bone. Studies of two-component materials (2-3 sheets of electrospun scaffold) implanted in the knee-joints of rabbits and fixed by photopolymerization demonstrated good crush resistance, biocompatibility and good adhesion of the implant with surrounding cartilage. Histological examination of the implants 3 month after implantation demonstrates absence of any inflammation and signs of replacement of the biodegradable scaffolds with normal cartilage. The possibility of intraoperative population of the implants with autologous cells is being investigated.

**Keywords :** chondroblasts, electrospun scaffolds, hyaline cartilage, photopolymerized gel

**Conference Title :** ICBE 2016 : International Conference on Biomaterials Engineering

**Conference Location :** Berlin, Germany

**Conference Dates :** May 19-20, 2016