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ECM mimetics: Biopolymer microheterogeneous hydrogels for tissue engineering and regenerative medicine

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One of the actual problems of tissue engineering and regenerative medicine is the search for biocompatible materials having the desired properties. The goal of the conducted studies was proof of the effectiveness of injectable biopolymer microheterogeneous hydrogels (IBMH): An independent implantable system to replace soft tissue defects including the stimulation of the regenerative processes of patient's own tissues; as a delivery system for the transplantation of cells and a temporary scaffold and a nutritive media while creating the tissue-engineered constructs. Compositions of IBMH were obtained from the hydrolysate of embryonic or postnatal tissues of animal 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. By varying the composition and size of the microparticles of crosslinked hydrolysate from 30 μm to 300 μm , and the ratio of solid and liquid phases, was established linear range of the IBMH with different rheological properties and time of bioresorption (from several weeks to several months). Using AFM analysis of microparticles IBMH the porous structure of particles with a pore size of 2-4 μm was found, which is a positive property in the processes of neovascularization and neoinnervation into the tissue-engineered constructs based on the IBMH. The results of experimental studies on the creation of cell-engineering constructs of cartilage tissue, liver and pancreas reveal about the ability of the IBMH long time to support the activity of the cells, including the processes of proliferation, differentiation, and synthesis of own ECM, which gradually replaces by resorbed ECM mimetic.

Biography

Victor I Sevastianov is the Head and Professor in Department for Biomedical Technology and Tissue Engineering from Shumakov Research Center of Transplantology and Artificial Organs of Moscow, Russia. He participated as a speaker in many conferences and presented keynote speeches in International conferences.

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