Ivana Veverková, J Tissue Sci Eng 2017, 8:4(Suppl)
DOI: 10.4172/2157-7552-C1-040

Hybrid inorganic-organic nanofibers with antibacterial activity for regenerative medicine

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The study deals with modifications of inorganic-organic nanofibers to optimize the manufacturing process and to ensure long-term antibacterial activity of the nanofibers. The nanofibers material is combination of poly(vinyl alcohol) and silica. Silica has a big potential for production of nanofibers for medical applications because it is able to meet a number of strict criteria (low toxicity, biodegrability, and biocompatibility) and provide suitable surface for functionalization; thanks to the Si-O bonds on the surface. Here, presented are two methods of nanofibers´ structure modifications: i) surface functionalization of the nanofibers by silver and copper nanoparticles, and ii) modification of initial sol by antiseptic additive. Silver ions are widely used to control bacterial growth in number of medical devices and materials. Silver ions and nanosilver are able to kill a wide range of bacteria including those which are resistant to antibiotics. CTAB contains the cetrimonium cation which is an effective antiseptic agent against bacteria and fungi. Both modification methods ensure significant antibacterial activity of inorganic-organic nanofibers, which was proven by *in-vitro* antibacterial tests. The antibacterial activity of all tested samples was highly above the limit in accordance with the CSN EN ISO 20645 standard evaluation. The antibacterial activity of the samples is caused by CTAB and silver nanoparticles application. It was verified that copper nanoparticles do not affect negatively the antibacterial activity. Copper nanoparticles´ effect is assumed to support the cell proliferation in the next phase of material testing. This novel material shows a big potential for wound dressing applications.

Biography

Ivana Veverková is a PhD student and Junior Researcher at Technical University of Liberec. Her research is focused on applicability of nanofibers in biomedicine, especially for regenerative medicine.

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