Jozsef Bako et al., J Biotechnol Biomater 2018, Volume 8
DOI: 10.4172/2155-952X-C1-088

Biodegradable polymer based electrospun nanofibers for dental applications

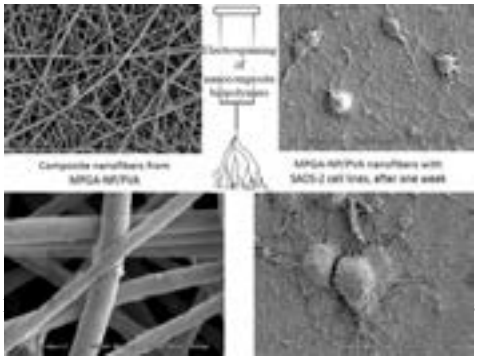
Jozsef Bako, Farkas Kerenyi, Lajos Daroczi and **Csaba Hegedus**
University of Debrecen, Hungary

Electrospinning is a versatile method for fabrication of submicron sized fibers from biopolymers, ceramics and composite materials. The dental application possibilities of these nanofibers are intensively research areas on the fields of tooth or pulp regenerations, prevention of dental caries, or drug delivery systems. Biopolymers can facilitate the elasticity of created structures, and ensure the similarities to the extracellular matrix. The tailoring of the diameters of the fibers, and pore sizes of the structures ensures the optimal conditions for the proliferation and differentiation of cells. The delivery of biological active ingredients, factors, or drugs can achieve fast and supported regeneration. Composite materials give possibly of adjusting physical, biological, or release properties. Nanofibers combined with inorganic ceramics, or polymers with nanoparticles can create functional materials for the speed up wound healing, or osseointegration processes.

Polymer solutions were created for electrospinning process from Poly-vinyl-alcohol (18-88 Ph, Eur.Merc) (PVA) in 10 w/w% and 50% precrosslinked, and 50% methacrylated-poly-γ-glutamic acid nanoparticles (MPGA-NP) in 15w/w%. Irgacure 2959 1w/w% was added to the composite as photoinitiator. Nanofiber fabrication was performed by Nanospinner NS1 electrospinning device (Inovenso). The created fiber matts were phtopolymerized by Bluehase 20i (Ivoclar Vivadent) dental lamp for 60sec, and the biocompatibility properties was investigated by Saos-2.

The diameters of created MPGA/PVA nanofibers were between 82.1-149.2 nm with the average of 120.7±17.5 nm. The crosslinking of the fibers by post photopolymerization was successful, and the fibers not dissolved during the one week cell proliferating test. The good biocompatibility of the created electrospun nanofibers was proved by the presence and proliferation of Saos cells.

This nanoparticles in the nanofibers construction allow and enhance the control of different drug releases.



Recent publications

1. Zafar M, Najeeb S, Khurshid Z, Vazirzadeh M, Zohaib S, Najeeb B, Sefat F (2016) Potential of Electrospun Nanofibers for Biomedical and Dental Applications Materials (Basel). 26;9(2). pii: E73.

2. Xue J, Xie J, Liu W, Xia Y, (2017) Electrospun Nanofibers: New Concepts, Materials, and Applications, Acc Chem Res. 15;50:1976-1987.
3. Bakó J, Kerényi F, Hrubi E, Varga I, Daróczi L, Dienes B, Csernoch L, Gáll J, Hegedűs C, (2016) Poly-γ-glutamic acid-nanoparticles based visible light-curable hydrogel for biomedical application, J Nanomater, 2016, Article ID 7350516, 10 pages.
4. Khan AS, Hussain AN, Sidra L, Sarfraz Z, Khalid H, Khan M, Manzoor F, Shahzadi L, Yar M, Rehman IU, (2017) Fabrication and *in vivo* evaluation of hydroxyapatite/carbon nanotube electrospun fibers for biomedical/dental application. Mater Sci Eng C Mater Biol Appl. 80:387-396.
5. Seog-Jin Seo, Hae-Won Kim, Jung-Hwan Lee, Electrospun Nanofibers Applications in Dentistry, (2016) Journal of Nanomaterials, Article ID 5931946, 7 pages.

Biography

Jozsef Bako is assistant lecturer on Biomaterials and Prosthetic Dentistry Department. He is graduated as a chemist, and holds PhD degree on Doctoral School of Dental sciences. He has published 16 research articles which were cited 59 times, the Hirsch index is 5. He has his expertise in nanostructured photopolymerizable polymer system fabrications and evaluations. His main research fields are the biodegradable polymer based hydrogel, nanogels and nanofibers as drug delivery systems. The research fields are connecting to scaffold creation for tissue regeneration aims by 3D printing methods and production of different inorganic/organic composites and nanofibers by electrospinning technique.

bako.jozsef@dental.unideb.hu

Notes: