Scaffolding Biodegradable Polymers for Soft Tissue Engineering

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Abstract

Over the last decade, biodegradable polymeric have received a considerable attention as promising components in scaffolds for soft tissue engineering, due to their ability to form structures which mimic the natural extracellular matrix, assuring the cell proliferation and survival while allowing diffusion of nutrients and other water-soluble metabolites. A variety of synthetic or natural polymers have been tested for tissue engineering and drug delivery applications, as binary or ternary systems, stabilized by ionic or covalent crosslinking.

The paper presents the works on biodegradable polymers scaffolding for soft tissue engineering, and it is focused on correlations between scaffold's chemistry and morphology with mechanical properties, biodegradation, bioadhesion, biocompatibility etc. Various mixtures between natural polymers and natural-synthetic polymers have been tested and crosslinking methods have been compared in the aim to control the interaction with cells and the behaviour in the human body. In designing scaffolds for tissue engineering or other biomedical applications, it is also necessary to match the mechanical properties of the target tissue and this make necessary to understand and control the physical and chemical factors involved in polymers organization and interactions. Studies have investigated methods for enhancing the mechanical strength of the scaffolds (e.g. controlling crosslink density) using different gelation and cross-linking methods. The polymer characteristics (average molecular weight, functionality, solubility and the ability to supramolecular structures are also discussed in terms of their biological performances. Due to their intrinsic characteristics and ability to tune a biological mobile surface, the biodegradable polymers became an important issue in the scaffolding of biomaterials for soft tissue engineering and provide a combination of biological interactions required for tissue functions, stimulatory cellular collagen production, and tissue organization and healing.

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References

1. A.Rusanu, A.I.Tamas, R.Vulpe, A.Rusu, M.Butnaru, L.Verestiuc, Journal of Nanoscience and Nanotechnology, Vol. 17, 1–8, 2017
2. R. Vulpe, M. Popa, L. Picton, V. Bălan, V. Dulong, M. Butnaru, L. Verestiuc, *Int. J.Biol. Macromol*., 84, 174-181,2016,
3. V. Balan, L.Verestiuc, *Eur. Polym. J*.. 53, 171–188, 2014.
4. A.M. Vasi, M. I. Popa, M. Butnaru, G. Dodi, L. Verestiuc, *Mater. Sci. Eng. C-Mater. Biol. Appl*., 38, 177–185, 2014.
5. S. Potorac, M. Popa, V. Maier, V, G.Lisa, L.Verestiuc, *Mater. Sci. Eng. C-Mater. Biol. Appl*. 32, 236-243, 2012.
6. V.Coma, L.Verestiuc, In *Medical Applications of Polymers*, Editors: M. Popa, R. M.Ottenbritte, C.V.Uglea, American Scientific Publishers, USA, Vol. 1, 64–108, 2011.