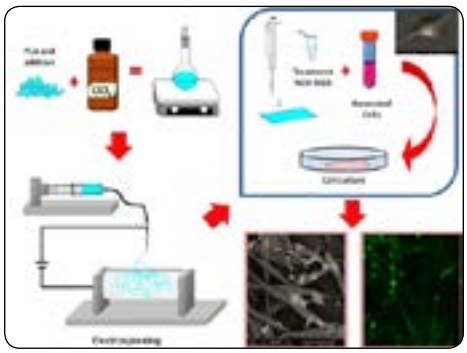
Mariana Gutiérrez et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Generation and evaluation *in vitro* of PLA scaffolds with starch, surface modified with RGD for bone regeneration

Mariana Gutiérrez[1], **Vladimir A. Escobar**[1], **Amaury Pozos**[2] and **Diana M. Escobar**[2]
[1]IPICYT, Mexico
[2]UASLP, Mexico

Statement of the Problem: Tissue engineering is an interdisciplinary discipline that seeks to repair or replace the tissue itself. Thus, and as a first step, polymeric scaffolds with different additive (starch) content were elaborated to provide support to cells (osteoblast) and observe their capability to grow and generate new extracellular matrix. Methodology & Theoretical Orientation: In this work, films of non-woven fibers of Poly (lactic acid) (PLA) with different starch content (0, 2.5, 5.0 and 10.0% by weight) were generated by electrospinning. Subsequently, such films were surface-treated (functionalization) with arginine-glycine-aspartic acid (RGD), with the aim of increasing the adhesion and cellular affinity toward the polymeric materials. Before functionalization, the structural morphology of the support was determined according to the starch content (0, 2.5, 5.0 and 10.0% by weight), using scanning electron miscroscopy (SEM). It was observed that the conformation of the material was drastically affected with the increment of starch content. Subsequently, *in vitro* tests were performed with osteoblast cultures for 48 hours, where the biocompatibility of the materials was evaluated by LIVE / DEAD tests in which the cell viability was discriminated by simultaneous staining with calcein AM that occurs in a fluorescent green to indicate intracellular esterase activity, ie live cells. These cells were observed under a CLSM (Confocal laser scanning microscopy). On the other hand, cell proliferation was performed by MTS assays after 48 hours of incubation. While the biocompatibility of the materials was validated by the morphology of the osteoblastic cells by SEM. Conclusion and meaning: The results of the various tests indicate that the obtained scaffolds, by electrospinning of PLA with starch, can be successfully used for the regeneration of bone system cells (osteoblasts); especially when the modification of the surface is done with RGD.



Recent Publications

1. Gutiérrez-Hernández, J. M., Escobar-García, D. M., Escalante, A., Flores, H., González, F. J., Gatenholm, P., & Toriz, G. (2017). *In vitro* evaluation of osteoblastic cells on bacterial cellulose modified with multi-walled carbon nanotubes as scaffold for bone regeneration. Materials Science and Engineering: C, 75, 445-453.
2. Haddad, T., Noel, S., Liberelle, B., El Ayoubi, R., Ajji, A., & De Crescenzo, G. (2016). Fabrication and surface modification of poly lactic acid (PLA) scaffolds with epidermal growth factor for neural tissue engineering. Biomatter, 6(1), e1231276.
3. Li, X., Chang, H., Luo, H., Wang, Z., Zheng, G., Lu, X., ... & Xu, M. (2015). Poly (3-hydroxybutyrate-co-3-hydroxyhexanoate) scaffolds coated with PhaP-RGD fusion protein promotes the proliferation and chondrogenic differentiation of human umbilical cord mesenchymal stem cells *in vitro*. Journal of Biomedical Materials Research Part A, 103(3), 1169-1175.
4. Ortiz, M., Rosales-Ibáñez, R., Pozos-Guillén, A., De Bien, C., Toye, D., Flores, H., & Grandfils, C. (2017). DPSC colonization of functionalized 3D textiles. Journal of Biomedical Materials Research Part B: Applied Biomaterials, 105(4), 785-794.

5. Shao, S., Zhou, S., Li, L., Li, J., Luo, C., Wang, J., & Weng, J. (2011). Osteoblast function on electrically conductive electrospun PLA/MWCNTs nanofibers. Biomaterials, 32(11), 2821-28.

Biography

Mariana Gutiérrez got her B.S. in Chemical Engineering and her MSc. and PhD, in Polymers. She has experience in characterization and synthesis of polymers. She has interest in synthesis of new materials intended for the regeneration of tissues. Currently, she is collaborating with researchers with experience in the area of health, especially *in vitro* test in order to establish structure-characteristics-performance relationships and then to design the polymeric composites.

mariana.gutierrez@ipicyt.edu.mx

Notes: